

# AUTOMOTIVE INDUSTRIES

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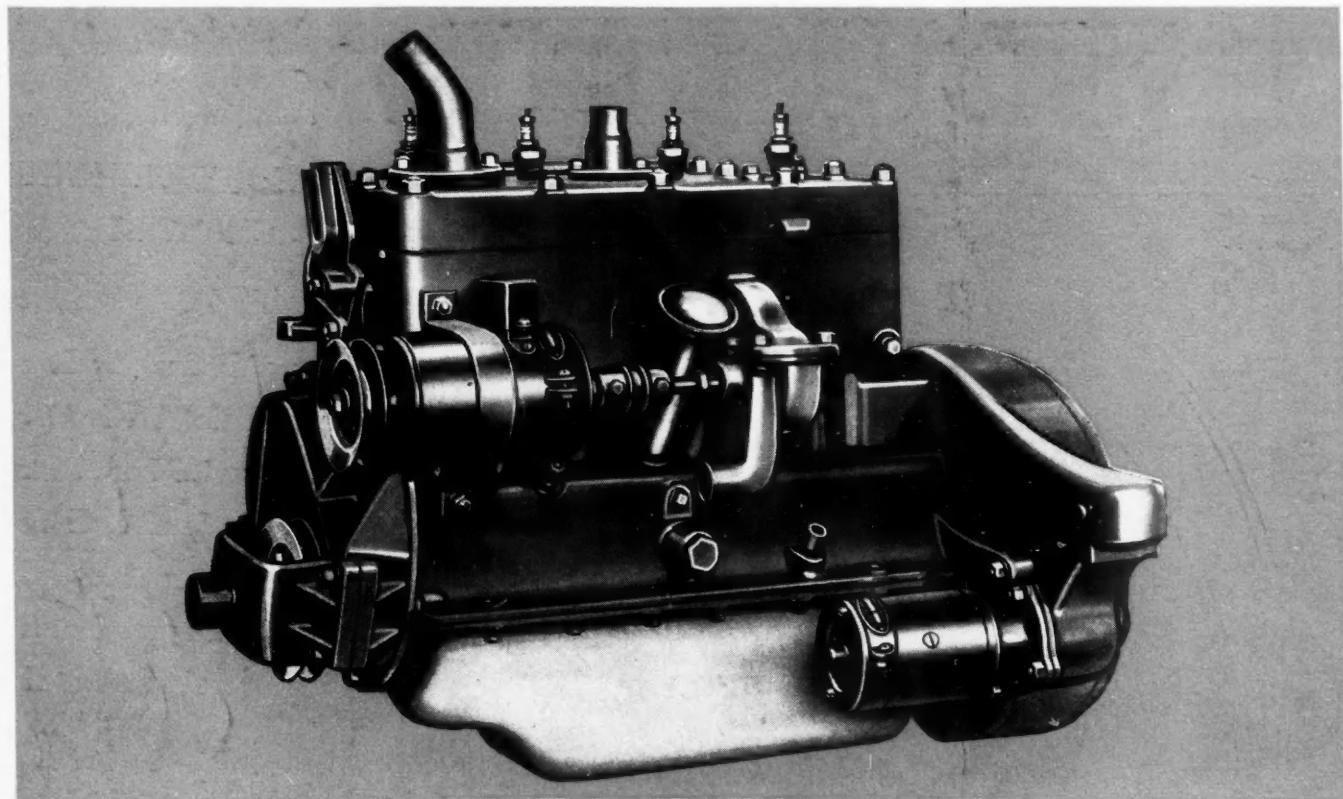
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## Continental Engines

# AUTOMOTIVE INDUSTRIES

*The AUTOMOBILE*

Vol. 64

Reg. U. S. Pat. Off.

No. 16

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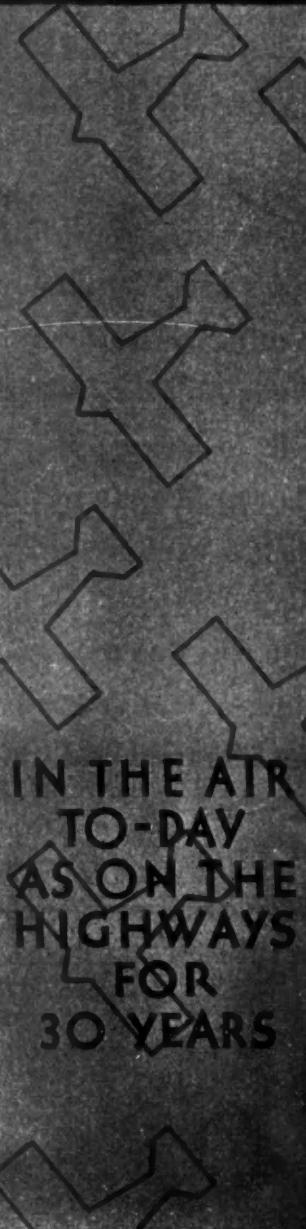
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Automotive Industries

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**9:45 p.m. Eastern Daylight Saving Time  
8:45 p.m. Eastern Standard Time  
8:45 p.m. Central Daylight Saving Time  
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The following N. B. C. stations will broadcast the program:

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WCKY	Covington	WKY	Oklahoma City
WFAA	Dallas	KDKA	Pittsburgh
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WEBG	Duluth-Superior	WHAM	Rochester
WDAY	Fargo	WOAI	San Antonio
KPRC	Houston	KSTP	St. Paul
WJDX	Jackson	WBZ	Springfield
		KVOO	Tulsa

# AUTOMOTIVE INDUSTRIES

VOLUME 64

APRIL 18, 1931

NUMBER 16

## Instalment Selling Outrides Storm of Depression With Few Defaults

by Leslie Peat

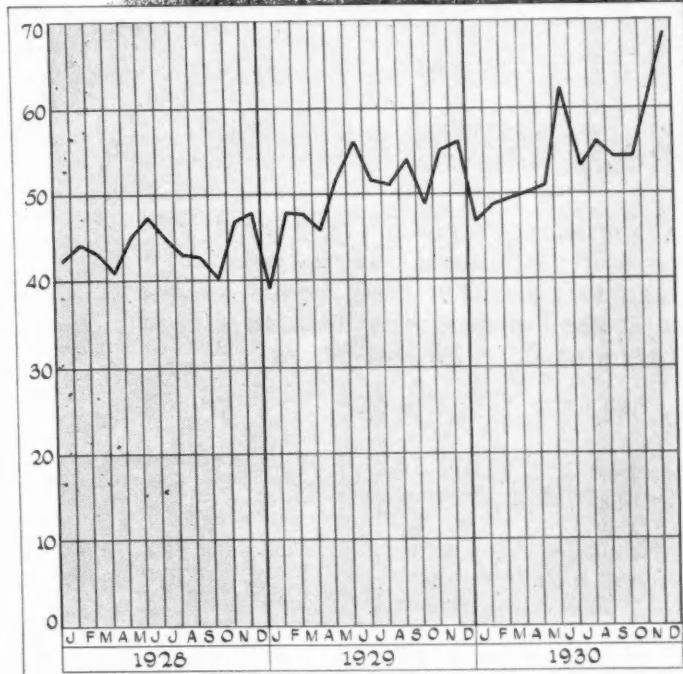
In a current analysis of automobile instalment selling, Milan V. Ayres\* concludes that defaults and repossession do not increase excessively during a period of depressed business conditions.

Disaster was rather widely predicted for financing companies more than a year ago, when the effects of the present slump had assumed panic proportions. A number of economists held that stress and strain would try finance companies sorely, and some went as far as to say that instalment selling would be proven uneconomic because the companies engaged in this business would not be able to overcome the effects of the depression.

Figures of finance companies, Mr. Ayres finds, showed:

1. A depression does not result in an excessive number of defaults and repossession, and does not produce any appreciable amount of frozen credits in the instalment field.
2. The liquidity of finance companies is not adversely affected by a depression. Finance company paper is,

\* Analyst, National Association of Finance Companies.



Courtesy, N.A.F.C.

There has been a sharp increase during 1930 in the ratio of new cars financed by 492 finance companies to new car registrations + + +

therefore, a desirable asset for banks during a slump period.

3. The volume of instalment buying during periods of boom and depression varies in about the same pro-

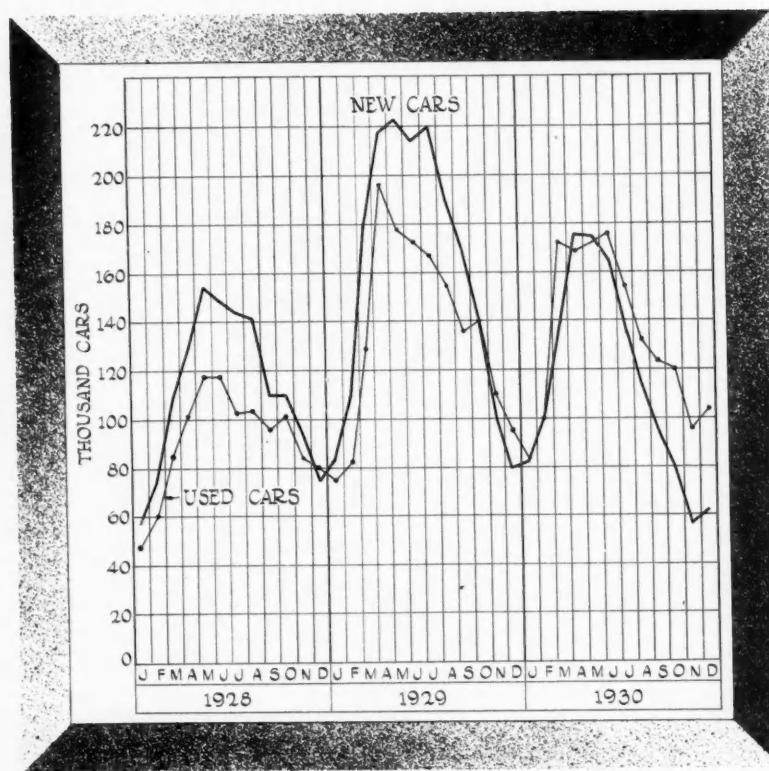
**Next Week** Beginning in our issue of April 25, P. M. Heldt will raise some fundamental questions of automobile design, particularly with reference to rear-engine mountings.

"Will Rear-Engine Cars Come Back?"—a review of early automobile design—will begin the series next week. Then will follow:

May 2. Chassis Design Considerations of Present Day Automobiles.

May 9. Some Design Possibilities of Rear-Mounted Engines.

May 16. Streamlining: Its Possibilities in Automobile Design of Tomorrow.



Data from 492 financing companies reporting to Department of Commerce.

**Finance companies are purchasing a larger percentage of used car paper. During the last quarter of 1929 and during most of 1930, monthly figures show the number of used cars financed exceed the figures for new cars for that period + +**

portion as the volume of all buying.

Repossessions and charge-off items, resulting from instalment paper acquired by many of the financing companies doing automobile business have been somewhat greater than usual. There has been no disturbance in regard to the situation at any time. One company reported that it purchased about 20 per cent less in accounts and bills in 1930 than during the previous year, but its net profits were off only about nine per cent.

This condition is believed to be typical, although the figures cannot be applied to finance companies as a whole. Most companies experienced some increase in defaults and repossession during the past 12 months, but few found these to be sufficiently great to be embarrassing.

Generally speaking, 1930 was a year of reduced business in the financing field, as in other phases of business activity. Because statistics are not available on instalment paper other than that of the 492 companies which report to the Department of Commerce the volume of automotive business done, instalment selling of cars and trucks is equally sound in good times as in periods of depression.

Banks have demonstrated their faith in finance companies to a marked degree during the slump of 1929-30. There has been no dearth of funds for finance companies to operate with during this period.

During 1929 banking institutions began to restrict loans to automobile dealers and to a large extent

#### Proportion of Total Retail Automobile Financing Funds for Used Cars:

28% in 1928

30% in 1929

37% in 1930

reduced their direct purchases of instalment paper. There is every evidence that this policy continued well into 1930. A large number of dealers went out of business during the past two years, but there is every indication that finance companies were able to get sufficient funds to operate with.

According to data collected by the National Automobile Dealers Association, the percentage of new passenger cars sold on instalments increased from 58.1 per cent in 1928 to 62.6 per cent in 1929. During the boom year, then, there was a gain of nearly five per cent in the ratio of automobiles bought on instalments and cars purchased for cash. This is shown on chart on preceding page, showing ratios by months.

The percentage of used cars sold on the instalment plan was slightly greater than the percentage of new cars sold during the period of from 1926 to 1929, inclusive. During the same period the number of used cars sold has been rapidly increasing, as has the ratio of used car sales to new car sales.

Dealers reporting to their association indicated that the ratio of used car sales to new car sales increased from 119 per cent in 1927 to 129 per cent in 1929. It appears likely that the increase in this ratio during 1930 will be even more marked, when final returns have been checked.

Chart II also shows that there seems to be a tendency for finance companies to purchase larger proportions of used car paper. That this policy is sound may be assumed because finance companies have access to rather comprehensive information regarding the trend of repossession and other factors of their business.

It has been alleged that through instalment buying, the  
(Turn to page 627, please)

#### Outlook for Car Sales is Good

Outstanding retail car financing during 1930 was less than 1929 figures, indicating obligations have been paid and way is now cleared for increased sales.

	1929 in Millions	1930 in Millions	1930 in Per Cent of 1929
January .....	\$641	\$805	123
February .....	631	755	120
March .....	669	745	111
April .....	734	758	103
May .....	806	769	95
June .....	869	781	90
July .....	928	775	84
August .....	966	759	79
September .....	965	736	76
October .....	960	708	74
November .....	911	661	73
December .....	866	623	72
Average .....	837	740	88

# Injection and Combustion in High Speed Diesel Engines Analyzed

Such factors as effects of elasticity of tube material and compressibility of oil, injection lag and ignition lag discussed in paper presented before joint meeting of 11 British engineering societies + + + + + + + + + + +

In a paper entitled "Injection, Ignition and Combustion in High-Speed Oil Engines," by S. J. Davies and E. Griffen, which was presented on March 31 before a joint meeting of 11 different British engineering societies, an attempt was made to indicate the present state of knowledge concerning these processes in airless-injection oil engines.

For the sake of an orderly treatment the authors divided the subject under two headings, *viz.*: processes within the fuel-injection system, and processes within the cylinder. Under the former head are considered the conditions in the pumps, connections and nozzles, the actions of which are all mechanical in character; under the latter heading come the mixing together of the fuel and air, the ignition of the fuel, the complete combustion of the fuel, and the resulting change in pressure and temperature of the working substance. In connection with the items under the first heading there is no need for distinguishing between the three different types of engine—the direct-injection, the antechamber and the air-chamber types—except in so far as the injection pressures and rates of injection are different. As regards the items under the second heading, however, there are marked differences between the actions of the three types.

By far the most important consideration in the pumps and the nozzles is the extreme precision in manufacture required, as these parts must meter and deliver the fuel under the desired conditions with great accuracy and be capable to do so over long periods without attention.

Factors which will tend to prevent such satisfactory performance are the elastic deformation (both under dynamic loading and under fuel pressure) of the fuel piping, etc., and the compressibility of the fuel. In connection with wear, one of the objections urged against the high-speed heavy-oil engine is that it is too much to expect that the extreme precision necessary for the working parts of the fuel systems can be maintained over any reasonable length of time. Great care must certainly be given to the hardness of such working parts as the pump spindles and barrels, and, as far as possible, all mechanical impurities in the fuel likely to lead to abrasion must be removed by careful filtering. But, after that, fears of a rapid reduction of accuracy by wear are not borne out by practice. Evidence of the constancy of performance of fuel pumps is given in Fig. 1, supplied by the Robert Bosch Co. This shows curves from two tests on the same fuel pump, the first as delivered new, the second after running for 80,000 miles in a motor truck. As regards elastic deformation, provided its importance is realized, this may be rendered negligible in effect by relatively straightforward design. The effects of the compressibility of the fuel, however, are complicated by the fact that, in addition to the reduction of the volume of fuel and the distortion of the piping, etc., under the direct fluid pressures, it may be necessary to take into account the effect of pressure waves in the system.

The reduction of volume of the fuel under pressure is obviously proportional to the volume of fuel in the

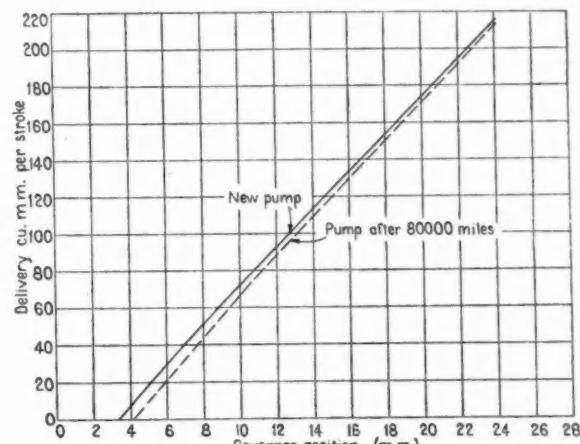


Fig. 1—Two delivery diagrams of the same pump, one taken when the pump was new and the other after 80,000 miles of operation, showing slight decrease of delivery after long use + + + + + + +

system, so that the volume of all pumps, passages, etc., should be made as small as possible. Passages should thus be smooth and direct, and of the smallest cross section consistent with the desired velocity of flow. And, since even minute quantities of air increase considerably the compressibility of the oil, there must be no possibility of air pockets in the system, and any air contained in the fuel—a condition inevitable in transport over rough roads—should be removed by filtering.

Information available concerning the physical characteristics of even the commonest fuels is by no means

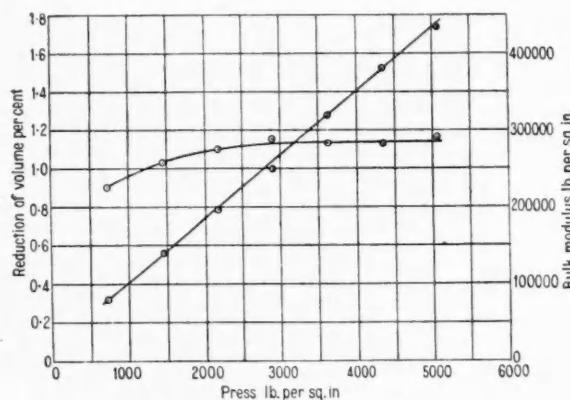


Fig. 2—Compressibility of fuel oil, according to D. H. Alexander. The inclined line shows the volume reduction in per cent for different surface pressures, while the nearly horizontal line shows the bulk modulus of compressibility, which is obtained by dividing the proportional volume compression by the surface pressure + + + +

complete. D. H. Alexander's results for the compressibility of a fuel oil up to pressures of 5000 lb. per sq. in. are given in Fig. 2, and show that the compressibility varies very little with pressure. R. S. Jessup has investigated the compressibility and thermal expansion of a number of petroleum oils, but although his temperature range was from 0 to 300 deg. C., the pressure only reached 700 lb. per sq. in. Fig. 3 shows the results from two gas oils of widely different densities and viscosities. He also found that the mean compressibility of gas oil decreases only slightly with increase of pressures, but, as the curves show, the compressibility is very susceptible to changes of temperature and is widely different for the two oils. Jessup found also that petroleum oils of the same density and viscosity had, within narrow limits, the same thermal expansion and compressibility.

The authors make quite an extended investigation of the possibility of pressure waves being formed in the fuel system, but reach the conclusion that, owing to the rapid damping, considered together with the fact that the natural frequency of the pipes usual in high-speed practice is very high when compared with the speeds of the engine, there is little likelihood that waves set up by resonance can influence the injection process. They state, however, that there is need for further experimental evidence on this point.

The element of the injection system which determines the final process of injection is the fuel nozzle, the function of which is, broadly, to so subdivide the liquid fuel and to control its direction of flow into the cylinder that it shall meet the air necessary for its

combustion at a suitable rate. The degree of fineness of subdivision and the direction arranged will depend upon the manner in which the mixing of the fuel with the air is to take place. The form of jet delivered by a nozzle can be finely atomized, or soft, or less finely atomized, and the penetration of the jet under a particular pressure at the nozzle is less the more finely the fuel is atomized. Good penetration and fine atomization can thus only be obtained simultaneously by extremely high injection pressures.

By far the majority of fuel nozzles on high-speed engines are either of the open type or of the spring-loaded, automatic-valve type. The advantage of the open type is its simplicity; its drawback is the relative lack of control over the injection after the pump has ceased delivery, with the possibility of dribbling as the velocities through the nozzle fall off. Against this drawback the spring-loaded nozzle offers distinctly better possibilities.

These possibilities follow from the introduction of two further means of controlling the injection: the valve at the nozzle may be set to open at any desired pressure; by employing a valve of suitable shape, the effective areas of cross section through the valve at various valve lifts can be given any desired values. By correlating the velocities at the pump and the pressures at the nozzle with these areas, the rates of injection can be controlled as desired over the whole period of injection. There is, perhaps, one further point that should be mentioned. The fuel pressure acting to open the valve against the spring pressure does not act on the area of the valve within the outside circumference of the seat; this area is subjected only to the pressure existing within the engine cylinder. Once the valve is open, however, and flow is taking place, the whole area is exposed to the fluid pressure, so that the fluid pressure at closing is actually lower than at the instant of opening the valve, depending upon the difference between these areas.

Correlation of the injection process with the processes within the cylinder remains today one of direct experiment in each case, as the variables controlling the mixing alone are too complex for the general conclusions from experiments apart from the engine to be applied directly to a practical design. Such experiments, however, indicate ways in which the mixing may be regarded, grouped under (a) hydraulics experiments, dealing with the discharge conditions which

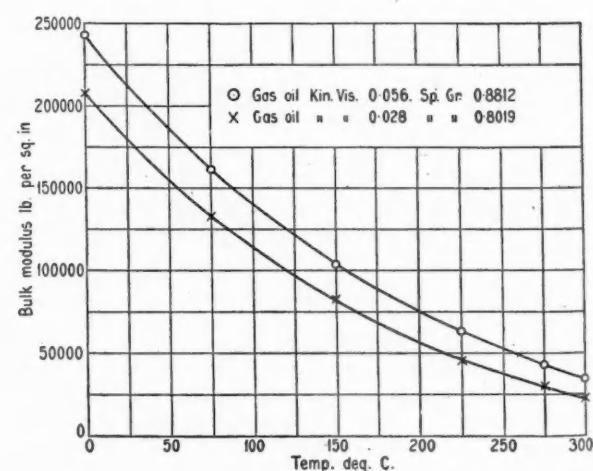


Fig. 3—Effect of temperature on the bulk moduli of compression of two different gas oils, according to Jessup + + + +

control the quantity discharged, the penetration, and the divergence of sprays; and (b) dynamics experiments, exploring the momentum of sprays under varying conditions of atomization, divergence and penetration. However, when conclusions have been reached under these headings, there is still the influence which combustion itself may exert upon the distribution of the fuel in the combustion air, so that at present every new engine constitutes a new experiment in this connection.

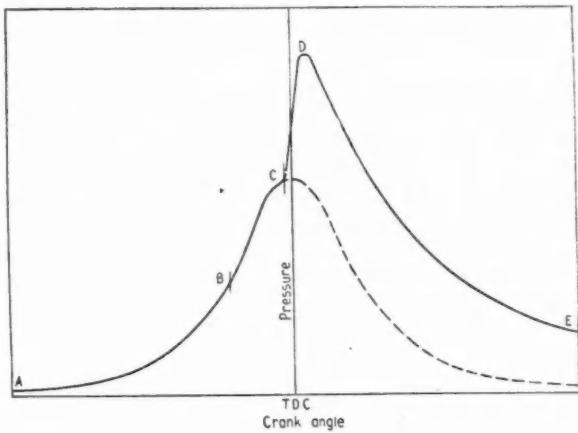


Fig. 4—Typical time-pressure diagram of a high-speed oil engine + + + + +

The importance of indicator diagrams as an aid to the study of these processes hardly needs to be emphasized, and for high-speed engines pressure-time diagrams obtained by means of indicators of the Farnboro type are invaluable. Fig. 4 shows such a diagram, and to facilitate consideration of the conditions governing ignition and combustion, this curve is divided into the parts *AB*, *BC*, *CD*, and *DE*. *B* marks the point at which injection of fuel into the cylinder begins, but it is found that no increase of pressure above that due to compression alone occurs until the point *C* is reached. Between *B* and *C* part or all of the fuel has been injected, but ignition does not begin until *C*, when combustion causes the much more abrupt rise of pressure from *C* to *D*. From *D* onward the pressure in the cylinder is governed mainly by the change in volume.

The interval of time from *B* to *C*, during which fuel is present in the cylinder but has not yet commenced to burn, or, more exactly, perhaps, has not yet caused an increase of pressure above that due to compression, is best described as the "ignition lag." Between *C* and *D* combustion is rapid, the rate at which the chemical energy of the fuel is being changed to pressure energy being given by the slope of *CD*. In general, the changes of volume between *C* and *D* are very slight, since the piston is near or at inner dead-center; the rate of rise of pressure from *C* to *D* is therefore dependent only upon the rate of burning of the fuel.

Now in considering the desirable form of the curve *ABCDE*, there are certain opposing conditions to satisfy. On the one hand, for maximum theoretical efficiency, combustion should take place at constant volume at the inner dead-center, that is to say, *CD* should be vertical; the output then depends on the height of *D*, the maximum pressure. On the other hand, early and very high values of maximum pressure increase the losses to the walls at and near inner dead-center

and bring down the thermal efficiency. Also, and what is more important, a high rate of pressure-rise will cause the running of the engine to be "rough," and will increase the loads on the working parts. So that, as a practical compromise, the slope of *CD* must not be too steep, and the maximum pressure should be reached shortly after dead-center, when its value will be lower. Of all the factors influencing the performance of high-speed oil engines, ignition lag and rate of pressure rise are the most important.

Ignition lag was first observed on an engine by Professor Hawkes, who then carried out a series of experiments to determine the conditions governing the ignition lag of shale oil under pressures and temperatures of the order of those met with in the engine. In the experiments the oil was injected axially into a cylinder of compressed air at the desired pressure and temperature. The results are shown in Fig. 5, and the sensitiveness of the ignition lag at low temperatures to changes of temperature is clearly seen. He found that the lowest temperature at which ignition occurred was 500 deg. F., the corresponding value of the ignition lag being 3.5 sec., and the results showed little difference with various pressures of the air from 200 to 400 lb. per sq. in., and with injection pressures from 2000 to 4000 lb. per sq. in.

Further experiments upon ignition lag were subsequently carried out by A. L. Bird at Cambridge and by Professor Neumann at Hanover, both using apparatus similar to that of Hawkes. They both saw that, in addition to temperature, the density, rather than the pressure, of the medium into which injection took place was also an important variable. In Bird's, as in Hawkes', tests, the air at injection was at rest, and the values of ignition lag are much too high to be correlated with those observed in actual engines.

Neumann used a fan in his vessel and measured the ignition lag with and without swirling of the air. His results are shown, for a pressure of 114 lb. per sq. in., in Fig. 6, ignition lag being plotted on temperature as base. Curve *A* was obtained with the air at rest, the lowest temperature at which ignition took place then being 509 deg. F.; curve *B* was obtained with swirling of the air, the lowest ignition temperature being 583 deg. F. Although the type of swirl set up probably bears little resemblance to that prevailing in the cylinder of a high-speed engine, its effects upon ignition lag are very definite.

Before ignition can be initiated it is obvious that the hydrocarbons in the fuel must be in a suitable state, whatever that may be, for the chemical reactions to begin and continue with sufficient rapidity. It is ob-

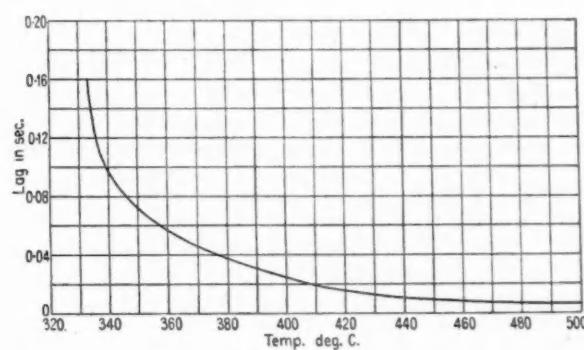


Fig. 5—Dependence of ignition lag of shale oil on temperature, according to Professor Hawkes + + + + + + + + +

vious that the droplets of fuel must undergo a considerable increase of temperature before combustion can begin, and must, therefore, in the short time available, take up heat rapidly from the high-temperature air. What is not so clear, however, is the nature of the physical changes in the fuel before and during the chemical combination of combustion, and it is desirable to consider the diverse theories advanced on this question.

It is thought by many that the droplets of fuel must be completely vaporized before ignition can begin,

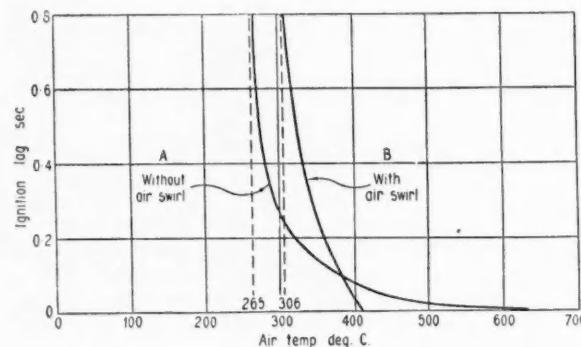


Fig. 6—Dependence of ignition lag upon temperature, with and without turbulence, according to Professor Neumann + +

combustion then taking place as in the gasoline engine. Evidence of a two-fold nature, however, contradicts this view of the combustion process. In the first place, Neumann has calculated the rate at which such a liquid droplet can take up heat, and, with the known values of the latent heats of evaporation and conductivities in the liquid, has found that, in the time available, not more than 5 per cent of the volume of the droplet can be vaporized, even when the air is given a swirling motion. In the second place there is the fact that if vaporization were the controlling factor, then those fuels which are most easily vaporized would behave best in the engine, but the contrary is the case. Actually, the ignition points of some gas oils are lower than their mean boiling points, so that with these fuels, which behave quite satisfactorily in the engine, complete vaporization before ignition is impossible; so that the complete process of combustion, as distinct from its initiation, cannot follow from complete vaporization.

An alternative view is that for ready ignition of the fuel particles a cracking of the oil into its lighter hydrocarbon fractions must take place. This condition, when examined, however, is found not to hold, since fuels which behave most satisfactorily in the engine show small tendency to crack, while other fuels which show the greatest tendency to crack are quite unsatisfactory as regards engine performance.

The following appears the best explanation in the light of present knowledge, and must be accepted in that sense. The oil droplets receive heat from the air during the interval of the ignition lag, and their surface temperature is raised towards that of their ignition point. Oxygen then combines with some of the surface hydrocarbon molecules to form unstable peroxides; these are immediately decomposed, with the evolution of such large amounts of heat that the ignition of the neighboring hydrocarbon molecules is

thus initiated; combustion proceeds subsequently with the rapidity corresponding to these high temperatures. Thus the interval of time up to the initiation of burning, *i.e.*, the ignition lag, is occupied mainly by the heating of the surface of the droplets, the ignition itself being of extremely short duration.

If this explanation of ignition lag be accepted, then the chief factor would appear to be the rate of heat transfer from the air to the droplets of oil. This question of heat transfer has also been considered by Neumann, and his calculations are both interesting and illuminating. Working back from the quantity of heat necessary to raise unit weight of fuel to the ignition temperature, and using the observed values of ignition lag of Fig. 6, he calculated the mean coefficients of heat transfer,  $a_m$ ; these are plotted in Fig. 7 on a base of the difference between the air temperature and the ignition temperature. Now, the values on this curve are of the order of 100 times the normal values for heat transfer from air to ordinary bodies, a fact which leads to the conclusion that chemical reactions, in addition to the mere transfer of heat, must be present. This conclusion is supported by the extremely rapid rise of  $a_m$  with the air temperature, which is, of course, consistent with the direct dependence of the speed of chemical reaction upon temperature. These results would seem to indicate that the rate at which heat can be transferred from the air to the oil is the dominant condition. Heat transfer depends upon the difference of temperature between air and fuel, and upon the relative motion of the air and fuel, and if the rate of ordinary heat transfer is increased, then the speeds with which these chemical reactions take place will be proportionately much higher. The latter take place more rapidly, also, the higher the density of the air, a circumstance which explains the lower values of ignition lag in high-compression engines when compared with those having lower compression pressures.

The authors examined some indicator diagrams supplied by the Associated Equipment Co., which had been taken with a Farnboro indicator on the company's sin-

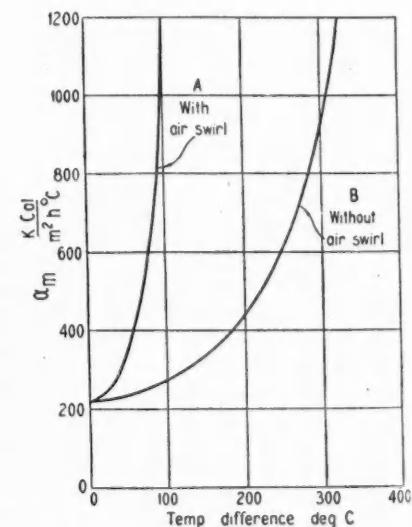


Fig. 7—Dependence of rate of heat transfer upon the temperature difference between the air and the fuel particles, with and without turbulence, according to Professor Neumann

gle-cylinder aero unit. In these tests the quantity of fuel injected per cycle was constant over a speed range from 500 to 2000 r.p.m., the brake mean effective pressure being of the order of 80 lb. per sq. in. Ignition lag in terms of both crank-angle and time is shown in Table I:

TABLE I.

Speed, r.p.m. ....	500	750	1000	1250	1500	1750	2000
Ignition lag, crank-angle deg. }	5	14	14	11	13	11	11
Ignition lag, time sec. ....	0.0017	0.0032	0.0024	0.0015	0.0015	0.0011	0.0009

While the processes of combustion in this "auxiliary air chamber" engine are by no means clear, these figures are convincing as showing how the engine speed affects ignition lag in this design.

A further interesting point concerning the ignition lag with this engine was noticed on examining the results from a series of tests at a constant speed of 1000 r.p.m. with brake mean effective pressures ranging from "no load" to 83.5 lb. per sq. in. The ignition advance was varied from 22 deg. at no load up to 28 deg., but the ignition lag was found to be sensibly constant. This is, however, consistent with the mode of operation of the fuel pump, in which the cut-off determines

pense of a slight increase of negative work during the compression stroke, lead to greatly improved smoothness of running and general reliability. To this end, therefore, a reduction of ignition lag, and a suitable control over combustion conditions, to give the curve  $BC'D$ , should be the objectives of further development work.

The behavior of engines with different fuels remains to be discussed. Here, again, generalizations from any particular type of design may prove misleading, and systematic and correlated investigation is necessary. It is general knowledge that fuels from different sources behave differently in any particular engine, both as regards ignition lag and smoothness of running, but little is known of the circumstances determining this behavior. "Pre-detonating dopes" or "ignition accelerators" have been proposed for the reduction of ignition lag. H. R. Ricardo has found, for instance, that small quantities of amyl nitrate are beneficial in this respect. Ethyl nitrate is another substance of which the influence is similarly beneficial.

Fig. 9 shows two indicator diagrams, supplied by the Associated Equipment Co., from their Acro engine, taken at a speed of 1000 r.p.m., both with the same brake mean effective pressure of 83.5 lb. per sq. in. The full-line diagram was obtained with an Asiatic fuel as delivered; the broken-line diagram was obtained with the same fuel to which five per cent of ethyl nitrate had been added. The improvement in the performance, both as regards the reduction in the maximum pressure and in the rate of pressure-rise, is striking; this was naturally borne out by the much more satisfactory running observed with the doped fuel. But it would be unwise to infer similar performances with these two fuels on an engine of different design.

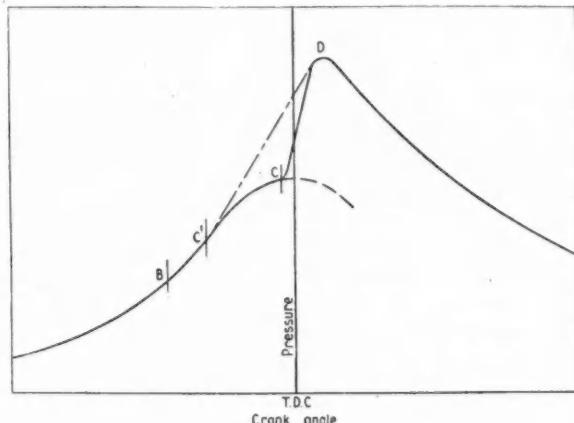


Fig. 8—Theoretical time-pressure diagram intended to bring out the effect of a reduction of the ignition lag + + + + +

the quantity of fuel injected, the rate up to the points of cut-off being constant at constant speed.

In connection with the processes within the cylinder, it is now possible, in the light of the foregoing considerations, to make certain inferences concerning the desirable form of indicator diagram. Referring to Fig. 8, it may be said that the position of points  $D$  and  $B$  are relatively fixed; the maximum pressure at  $D$  is limited, in a particular design, by questions of strength, and its position with respect to inner dead-center by the question of thermal efficiency; the "earliness" of  $B$  is limited by the rate of heat transfer from air to fuel possible with a particular design. So that the maximum interval from  $B$  to  $D$  being limited, the problem is to make the best possible use of this interval.

This interval is made up of  $BC$ , the ignition lag, and  $CD$ . Thus, by reducing the ignition lag, as from  $BC$  to  $B'C'$ , the interval available for the rise of pressure to  $D$  is increased, and the mean slope, showing the mean rate of pressure-rise, decreased from the full line  $CD$  to the broken line  $C'D'$ . This change will, at the ex-

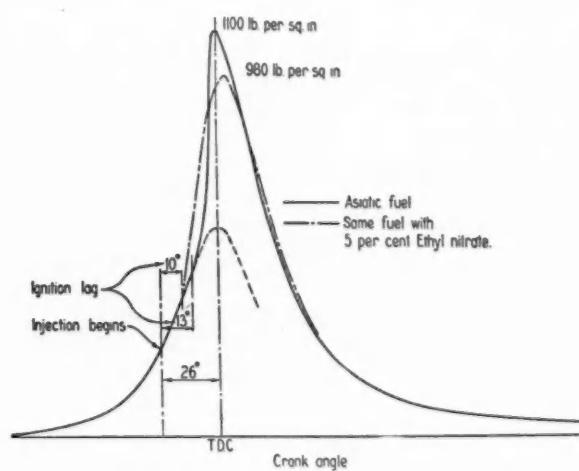


Fig. 9—Cylinder diagram showing the effect of an addition of ethyl nitrate on the ignition lag and the rate of combustion

# JUST AMONG OURSELVES

## Truck Restrictions And Freight Rates

IT'S our curbstone opinion that state restrictions on truck-trailer train lengths are going to be more potent than reduced freight rates in sending back to the railways automobile freight which now is being trucked-away from factories.

Indiana has already passed a law, of course, restricting truck-trailer combinations to 40 ft. Bills proposed in other states would hold lengths anywhere from 28 to 45 ft. Such length restrictions would, in many cases, eliminate from the roads such truck-trailer combinations as are now commonly used in carrying automobiles from factories over the highways.

Coupled with freight rate reductions, these restrictions may drive back to the rails a fair amount of automobile business which otherwise would have been carried by truck. But, too, it might increase actual drive-aways.

In any case, the writing of specific dimensional standards into state laws is unsound, uneconomic and unprofitable to the public in the long run. Such restrictions should be in the form of regulations administered by state officials with power to change them as conditions of operation change. As matters stand the laws are always bound to run behind current economic

possibilities and necessities by many years.

The evil results of machine tool obsolescence are economic advantages compared to those of automotive law obsolescence.

\* \* \*

## Show Records Show Power

WITH accurate or published figures unavailable, trying to estimate how attendance at 1931 automobile shows compared with that at the 1930 series of exhibitions is pretty much like trying to guess the number of beans in a jar.

From what we can find out, however, there were more than half a million people paid admissions in 1931 to see the new cars on display at the two national and approximately fifty local shows even in the face of poor business conditions.

Attendance was smaller this year than last at practically every automobile show held, although there were one or two outstanding exceptions to this rule. On the average the 1931 attendance ran something like 25 to 30 per cent behind 1930 totals, which isn't at all bad everything considered.

The show records made during 1931, in other words, bring fresh evidence of the perennial power of these great annual

automotive promotion activities. May they run on successfully forever!

\* \* \*

## When Automobile Was an Adjective

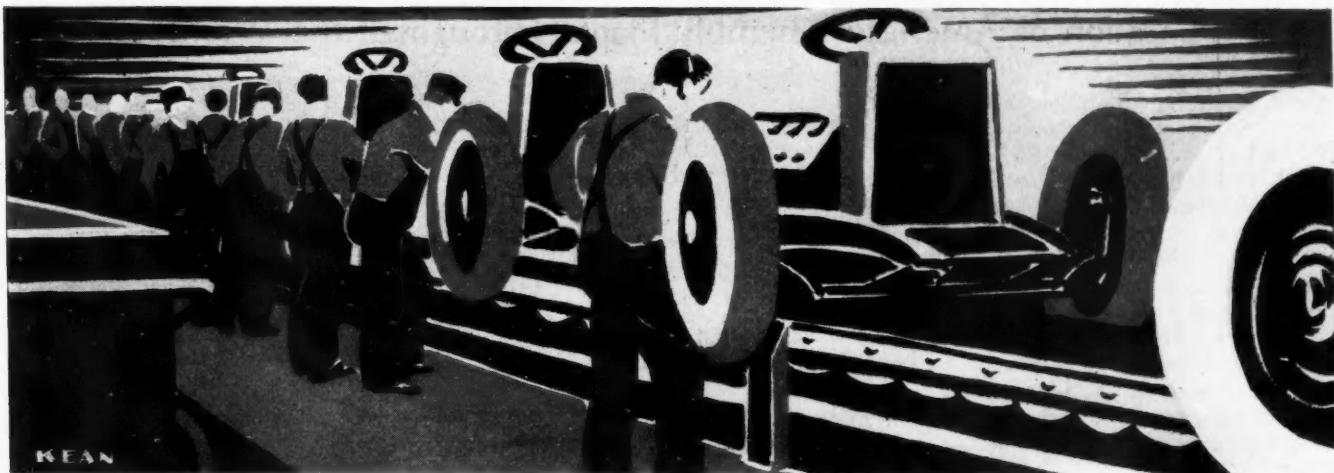
A SCOUTING party for our Automotive Oddities page recently unearthed some interesting information from G. & C. Merriam Co., publishers of Webster Dictionaries, concerning the first appearance of the words gasoline, automobile and garage.

The word "gasoline," it seems, first appeared in the Supplement (Copyright 1879) to the Webster's Unabridged Dictionary of 1864. It was there defined as "A highly volatile mixture of fluid hydrocarbons obtained from petroleum, as also from the distillation of bituminous coal—also written gasolene."

Definition of "automobile," noun, was included in the entry for "automobile," adjective, in the Supplement (Copyright 1900) to Webster's International Dictionary (Copyright 1890). It read, "An automobile vehicle or mechanism."

Webster's New International Dictionary of 1909 contained an entry for "garage," defined as "a place for housing automobiles."

So that's that — thanks to H. W. H. of the Merriam organization.—N. G. S.



# 149 Assembly Plants Supply World's Demand for American Automobiles

During two-year period total number has decreased by one in the foreign field and five in the United States + + +

By A. Burdet Crofoot

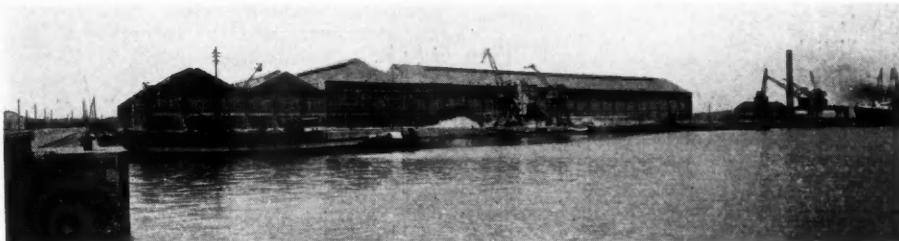
RECENT decision on the part of the Canadian Government to raise the tariff on automobiles shipped into the country has led American manufacturers who do not have assembly facilities in that country, but who have sufficient market there to make a serious effort to retain it, to begin looking toward plants available in that country for that purpose. Already Nash has made plans to have cars assembled at the Durant Motors of Canada plant at Toronto, and while there has been an injunction filed against Canadian Durant, tem-

porarily stopping this procedure, it does not seem likely that the plan will not be consummated.

Hupp and Reo, too, are planning to reopen assembly operation in Canada, Hupp at a plant where it was formerly operating, and Reo at the former Dodge plant in Toronto, but with a charter that it took out 22 years ago. Various other companies are reported looking to Canada with the idea of acquiring some sort of assembly facilities, notably Hudson, but at the time this is being written, nothing has come of these studies.

This fresh interest in Canadian assembly makes particularly timely a resurvey just conducted by AUTOMOTIVE INDUSTRIES of the whole picture of assembly of American cars throughout the world, bringing up to date one published two years ago.\* The attached list does not show any of the operations mentioned above, because none of them are yet actually operating. The Nash situation does not represent an actual increase in the number of foreign plants, as it will take place in a plant already operating on that basis, but it will bring Nash into the foreign picture where it was not represented before. Both Hupp and Reo have assembled

\*Automotive Industries, Page 658, April 27, 1929.



General Motors' foreign assembly plant on the River Scheldt, Antwerp, Belgium, as seen from across the river + + + + + + + +

## Location of American Assembly Plants Throughout the World

MAKER	DOMESTIC		FOREIGN	
	NUMBER	LOCATION	NUMBER	LOCATION
Auburn	3	Auburn, Connersville and Indianapolis, Ind.		
Austin	1	Butler, Pa.		
Buick	1	Flint, Mich.		
Cadillac	2	Detroit, Mich.		
Chevrolet	9	Atlanta, Ga.; Buffalo, N. Y.; Flint, Mich.; Janesville, Wis.; Kansas City, Mo.; North Tarrytown, N. Y.; Norwood, Ohio; Oakland, Calif.; St. Louis, Mo.		
Chrysler	4	Detroit, Mich.	4	East Windsor and Walkerville, Ont., Canada; Berlin, Germany; London, England
Cunningham	1	Rochester, N. Y.		
De Soto (See Chrysler)				
De Vaux	2	Grand Rapids, Mich.; Oakland, Calif.		
duPont	1	Springfield, Mass.		
Dodge (See Chrysler)				
Duesenberg (See Auburn)				
Durant	1	Lansing, Mich.	1	Toronto (Leaside), Canada
Essex (See Hudson)				
Ford	34	Atlanta, Ga.; Buffalo, N. Y.; Cambridge, Mass.; Charlotte, N. C.; Chester, Pa.; Chicago, Ill.; Cincinnati, Cleveland and Columbus, Ohio; Dallas, Tex.; Dearborn, Mich.; Denver, Colo.; Des Moines, Iowa; Edgewater, N. J.; Houston, Tex.; Indianapolis, Ind.; Jacksonville, Fla.; Kansas City, Mo.; Long Beach, Calif.; Louisville, Ky.; Memphis, Tenn.; Milwaukee, Wis.; New Orleans, La.; Norfolk, Va.; Oklahoma City, Okla.; Omaha, Neb.; Philadelphia and Pittsburgh, Pa.; Portland, Ore.; St. Louis, Mo.; San Francisco, Calif.; Seattle, Wash.; Somerville, Mass.; Twin City, Minn.	33	Antwerp, Belgium; Asnieres (Seine), France; Barcelona, Spain; Berlin, Germany; Buenos Aires, Argentine; Copenhagen, Denmark; Manchester, England; Mexico City, Mexico; Rio de Janeiro and Sao Paulo, Brazil; Santiago, Chile; Istanbul, Turkey; Trieste, Italy; Montreal, Toronto, Vancouver, Windsor and Winnipeg, Canada; Bombay, Calcutta, Madras and Multan, India; Adelaide, Brisbane, Geelong, Perth, and Sydney, Australia; Port Elizabeth, South Africa; Singapore, Straits Settlements; Auckland, Timaru and Wellington, New Zealand
Franklin	1	Syracuse, N. Y.	22	Adelaide, Brisbane, Melbourne, Perth and Sydney, Australia; Antwerp, Belgium; Batavia, Java; Berlin, Germany; Bombay, India; Buenos Aires, Argentine; Copenhagen, Denmark; London, England; Montevideo, Uruguay; Osaka, Japan; Oshawa, Regina and Walkerville, Canada; Port Elizabeth, South Africa; Sao Paulo, Brazil; Stockholm, Sweden; Warsaw, Poland; Wellington, New Zealand
General Motors (See Units)			3	London, Eng.; Berlin, Ger.; Brussels, Belgium
Graham-Paige	1	Detroit, Mich.		
Hudson	1	Detroit, Mich.		
Hupp	2	Detroit, Mich.; Cleveland, O.		
Jordan	1	Cleveland, Ohio		
La Salle (See Cadillac)		(See G.M.)		
Lincoln	1	Detroit, Mich.		
Marmon	1	Indianapolis, Ind.		
Martin	1	Hagerstown, Md.		
Nash	3	Kenosha, Milwaukee and Racine, Wis.		
Oakland	1	Pontiac, Mich.		
Oldsmobile	1	Lansing, Mich.		
Overland	2	Toledo, O.; Los Angeles, Calif.		
Packard	1	Detroit, Mich.		
Peerless	1	Cleveland, Ohio		
Pierce-Arrow	1	Buffalo, N. Y.		
Plymouth (See Chrysler)				
Pontiac (See Oakland)				
Reo	1	Lansing, Mich.		
Studebaker	1	South Bend, Ind.		
Stutz	1	Indianapolis, Ind.		
Willys-Knight	1	Toledo, Ohio		



The Ford assembly plant at Edgewater, N. J., cares for the surrounding territory and exports + + + + + + + + +

cars in Canada in the past, so that the present plans represent reentries into that picture.

There have been a number of changes in the location of assembly plants for American automobiles during the past two years, and the total number of plants in which American passenger cars are assembled is somewhat less than it was when *Automotive Industries* published its first list of these plants.

There are today 149 plants scattered throughout the world in which American passenger cars are assembled, as compared with 155 at that time. Of these plants 82 are located within the confines of the United States and 67 are located abroad, showing a loss of one in the foreign plants and a loss of five in American plants. The change in this country can be accounted for by the passing out in the interim of the Stearns Knight, Davis and Locomobile, Elcar, Kissell, Mercer, Ruxton, Moon and Gardner cars, and the addition in the meantime of the American Austin and the Martin, production of which is beginning at this time in Hagerstown, Md. Inasmuch as De Vaux is being made in a plant formerly occupied by Durant, it represents no change in the number of plants. The fact that De

Vaux is using one plant which was not formerly used for automobile assembly, namely its Grand Rapids plant, is further offset by the fact that Hupmobile is assembling cars in only one plant in Cleveland whereas at the time of our previous survey it was assembling cars in two plants in that city.

The greatest change has come about in foreign assembly, particularly in Ford activities abroad. Ford has dropped completely the plants at Alexandria, Egypt, and Pernambuco, Brazil, and a number of other of its foreign plants listed in the previous list are used now as service plants rather than as assembly plants. These plants include Yokohama, Japan; Havana, Cuba; Helsingfors, Finland; Lima, Peru; Montevideo, Uruguay; Rotterdam, Holland; and Stockholm, Sweden. On the other hand, Ford has added plants at Istanbul, Turkey; Vancouver, Canada; Multan, Madras, and Calcutta, India; Geelong and Adelaide, Australia; Singapore, Straits Settlements, and Auckland, Wellington and Timaru, New Zealand. These three New Zealand plants are not owned by Ford but are used by a

distributor for the assembly of Ford Cars. One plant was listed in Geelong, Australia, before, so the fact that there are now two represents an increase. Incidentally, Ford cars are today being assembled from parts manufactured in this country at Nizhni-Novgorod; Moscow and Karkhov in the Soviet Union. These have not been listed as American plants, as they are owned and operated by the Soviet Union.

In the field of domestic manufacture Michigan, as is to be expected, still leads with 19 plants although this state showed 20 plants two years ago. This is due to the fact that Studebaker has consolidated the operations

### Distribution of Plants by States

MANUFACTURE AND ASSEMBLY	ASSEMBLY ONLY	TOTAL	MANUFACTURE AND ASSEMBLY	ASSEMBLY ONLY	TOTAL
Michigan . . . . .	19	19	Kentucky . . . . .	1	1
Ohio . . . . .	5	9	Louisiana . . . . .	1	1
Indiana . . . . .	6	7	Minnesota . . . . .	1	1
Missouri . . . . .	4	4	Nebraska . . . . .	1	1
New York . . . . .	3	6	New Jersey . . . . .	1	1
Wisconsin . . . . .	3	5	North Carolina . . . . .	1	1
California . . . . .	1	5	Oklahoma . . . . .	1	1
Pennsylvania . . . . .	4	5	Oregon . . . . .	1	1
Massachusetts . . . . .	3	4	Tennessee . . . . .	1	1
Georgia . . . . .	2	2	Virginia . . . . .	1	1
Texas . . . . .	2	2	Washington . . . . .	1	1
Colorado . . . . .	1	1	Maryland . . . . .	1	1
Florida . . . . .	1	1			
Illinois . . . . .	1	1			
Iowa . . . . .	1	1			
			Total . . . . .	40	82

## Distribution of Assembly Plants by Cities

### MANUFACTURE AND ASSEMBLY

Detroit, Mich.	11	Butler, Pa.	1	Oakland, Cal.	1
Cleveland, Ohio	3	Connersville, Ind.	1	Pontiac, Mich.	1
Indianapolis, Ind.	3	Dearborn, Mich.	1	Racine, Wis.	1
Lansing, Mich.	3	Grand Rapids, Mich.	1	Rochester, N. Y.	1
Flint, Mich.	2	Hagerstown, Md.	1	Springfield, Mass.	1
Toledo, Ohio	2	Kenosha, Wis.	1	South Bend, Ind.	1
Auburn, Ind.	1	Milwaukee, Wis.	1	Syracuse, N. Y.	1
Buffalo, N. Y.	1				
				Total	40

### ASSEMBLY ONLY

Atlanta, Ga.	2	Des Moines, Iowa	1	North Tarryton, N. Y.	1
Buffalo, N. Y.	2	Edgewater, N. J.	1	Norwood, Ohio	1
Kansas City, Mo.	2	Houston, Tex.	1	Oakland, Cal.	1
St. Louis, Mo.	2	Indianapolis, Ind.	1	Oklahoma City, Okla.	1
Cambridge, Mass.	1	Jacksonville, Fla.	1	Omaha, Neb.	1
Charlotte, N. C.	1	Janesville, Wis.	1	Philadelphia, Pa.	1
Chester, Pa.	1	Long Beach, Cal.	1	Pittsburgh, Pa.	1
Chicago, Ill.	1	Los Angeles, Cal.	1	Portland, Ore.	1
Cincinnati, Ohio	1	Louisville, Ky.	1	San Francisco, Cal.	1
Cleveland, Ohio	1	Memphis, Tenn.	1	Seattle, Wash.	1
Columbus, Ohio	1	Milwaukee, Wis.	1	Somerville, Mass.	1
Dallas, Tex.	1	New Orleans, La.	1	Twin City, Minn.	1
Denver, Col.	1	Norfolk, Va.	1		
				Total	42

formerly conducted in Detroit with its South Bend operations. Detroit shows eleven plants engaged in both manufacture and assembly, none of the plants in Michigan being devoted to assembly only.

Next to Michigan, Ohio still comes second with nine plants, five of which are used for both manufacture and assembly and four for assembly only. The dropping of the Stearns Knight operation and the consolidation of the Hupp operations already referred to reduces the number of plants in Ohio by two, as compared with the previous survey.

Indiana still comes second in the list of plants devoted to both manufacture and assembly and third in the total number of plants, with six in the first category and one assembly only or a total of seven plants. In this state, too, there is a net loss of two plants due to the passing out of the Davis and Elcar.

Operations for assembly only are carried on in 25 out of the 48 states, this distribution being the same as it was in the previous study.

Distribution by states of the manufacturing and assembly industry shows a net loss of two, due to the fact that with the passing of the Locomobile the manufacture of completed cars is no longer represented in Connecticut, and with the transfer of du Pont from Wilmington to Springfield, Mass., where assembly operations were already being carried on. Delaware is no longer represented.

Completed cars are now being produced.  
(Turn to page 624, please)

## Foreign Assembly Plants

### BY CONTINENTS

Europe	21	South America	7
Australasia (Including D.E.I.)	16	Africa	2
North America	14		
Asia	7	Total	67

### BY COUNTRIES

Canada	13	Italy	1
Australia	11	Japan	1
England	5	Java	1
Germany	5	Mexico	1
India	5	Poland	1
New Zealand	4	Spain	1
Belgium	3	Straits Settlements	1
Brazil	3	Sweden	1
Argentina	2	Turkey	1
Denmark	2	Uruguay	1
South Africa	2		
Chile	1		
France	1	Total	67

# Hercules Aims at Simplicity in Its New JX Series Engines

These new powerplants are built in three sizes for use in commercial cars of  $\frac{3}{4}$  to  $1\frac{1}{2}$  tons and general heavy duty service + + + + + +

THE Hercules Motors Corp., Canton, Ohio, is offering an additional line of heavy-duty, six-cylinder L-head engines, these Series JX engines being available in three different sizes as follows:

Model	Bore	Stroke	Displacement
JXA	$3\frac{3}{8}$	$4\frac{1}{4}$	225 cu. in.
JXB	$3\frac{5}{8}$	$4\frac{1}{4}$	263 cu. in.
JXC	$3\frac{3}{4}$	$4\frac{1}{4}$	282 cu. in.

All three engines are identical in design and in installation dimensions. They are, moreover, related to the 00 series of four-cylinder engines, and many of the parts, such as connecting rods, timing gears and valve mechanisms, are interchangeable between the two series. While the JX series is a strictly heavy-duty line, all are designed to meet present-day needs and to withstand the stresses of high-speed operation. Utmost

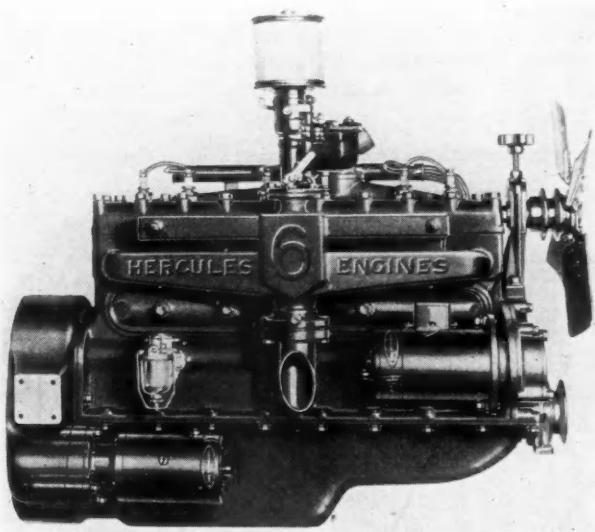
simplicity has been the aim in the design of these engines and it is the belief of the manufacturer that they comprise fewer parts than any comparable engines.

The crankcase is cast integral with the cylinder block and the crankshaft is supported in seven main bearings, all  $2\frac{1}{2}$  in. in diameter, the total projected bearing surface being 27 sq. in. Lubrication is by a gear pump of large capacity, which delivers oil under pressure to all main and connecting-rod bearings. The gear train is lubricated through a bleeder from the main pressure line. At 100 r.p.m. of the engine the oil pump delivers 1.4 gal. p. min. A centrifugal water-circulating pump is fitted, and fan drive through a V-belt is provided for.

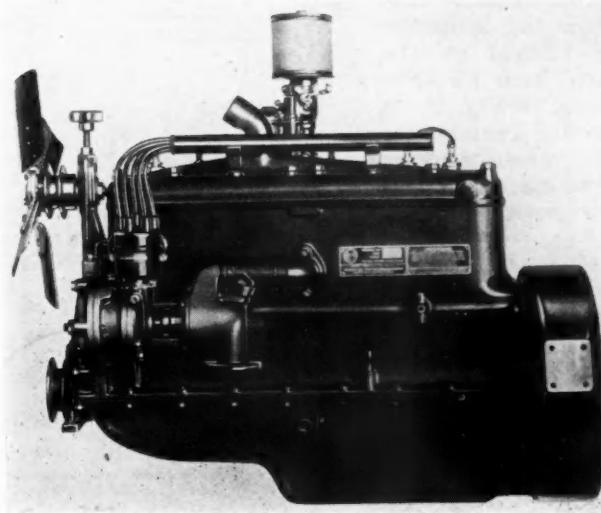
The Hercules Series JX engines can be arranged for either downdraft or updraft manifolds, and exhaust manifolds may have either center or rear downtakes. These engines are available for either three-point or four-point support, and they are offered with S. A. E. Nos. 1, 2 and 3 bell housings, at the option of the customer. Provisions are made for an S.A.E. No. 1 flange-type generator and starting motor. The ignition unit, which is driven through gearing from the accessories shaft, is located on water-pump side. Magneto mounting is also provided for. The camshaft is supported in four bearings and is located on the right-hand side, looked at from the flywheel end.

As regularly supplied, all three engines peak at between 3000 and 3100 r.p.m. Maximum torques are obtained at 1000 r.p.m. and amount to 142, 164, and 176 lb.-ft., while the horsepower developed at 2800 r.p.m. are 59.5, 68.5 and 73.5 respectively.

These engines are suited for use in commercial cars of  $\frac{3}{4}$  to  $1\frac{1}{2}$  tons capacity, as well as for use in taxicabs, and for general agricultural, industrial and oil field uses.



Hercules JX series six-cylinder engine, showing both the accessory and manifold sides. The crankcase is cast integral with the cylinder block and the crankshaft is supported in seven main bearings + + + +



# Demand for Noiseless Bodies of Insulating Materials and

**TABLE I** General Construction Specifications—

The Murray Corp. of America.

1. Waterproof sealer to be sprayed on all roof bows, sub-roof rails, rear roof rails, side roof rails and front roof rails after assembly.
2. Friction paste is to be used between wood and metal, wood and wood, or metal to metal.
3. Bedding putty or equivalent is to be used for setting stationary glass.
4. All wood parts are to have one coat of wood preservative before panels are applied; wood parts applied after the body is in white must also have one coat of wood preservative to insure protected surface on all wood parts.
5. All machine screws when used in clamping hinges to pillars are to be locked in place either by center punching in two places or by using shakeproof washers.
6. Blue wadding to be used as specified between strainers and outside panels. Wadding to be saturated with friction paste.
7. Felt or salvaged scrap trim material to be used between roof bows and wire netting.
8. Aluminum paint is to be used on all metal parts that are not accessible for priming after assembly.
9. Carbonated lead to be used under all drip moldings applied to body before painting.

by  
Joseph  
Geschelin

rubber, felt, friction tape and other anti-friction and sound-proofing materials.

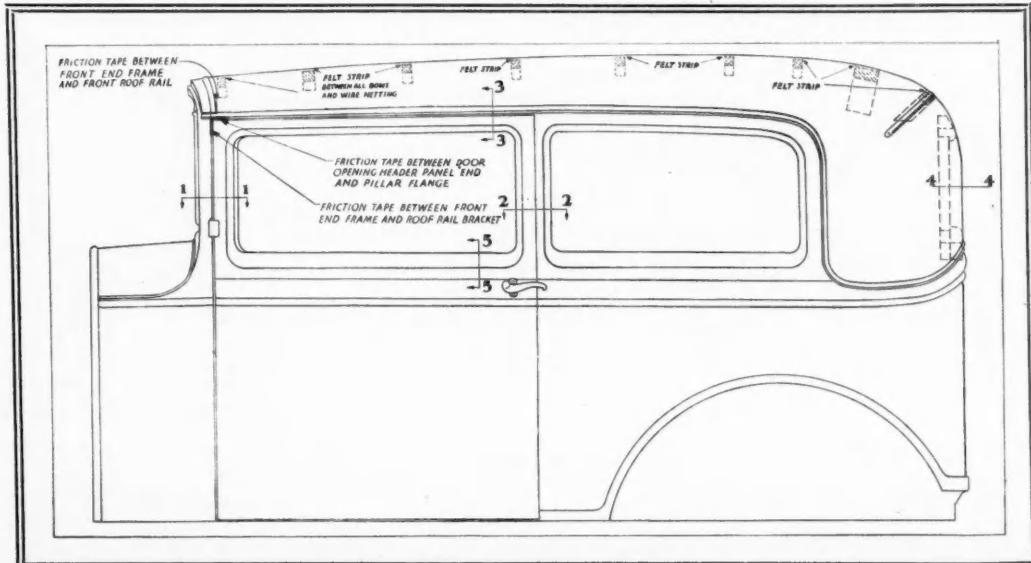
In Murray construction before the frame is built up, all wood parts are impregnated in a special wood preservative. The use of glue in frame joints

was abandoned some years ago. All wood-to-wood joints are close fitted with a lateral clearance, the strength of the joint being maintained by wood screws and steel brackets. Finally, all joints are bedded in anti-friction paste consisting of asbestos-graphite in an oil vehicle. This paste is said to be permanently elastic, at least for the life of the car. The same friction paste is used wherever

OME of the fundamental ideas concerning body silencing were discussed in *Automotive Industries*, April 4, 1931. The present article is concerned with current practice in certain outstanding body plants and gives examples of actual constructional details as well as specifications of the materials employed.

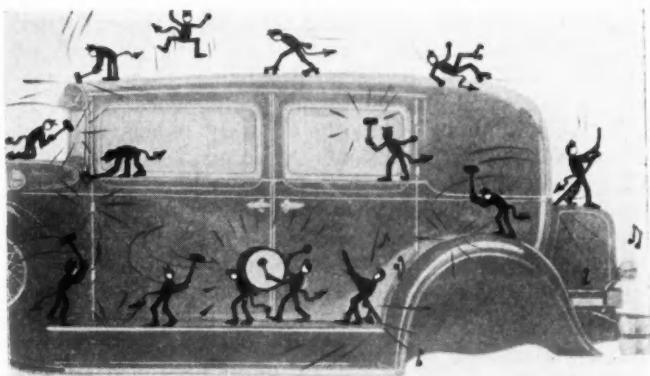
An excellent example of a well-insulated and carefully-silenced composite body is the Murray body, which is shown in Fig. 1. Typical cross-sections, selected because they show the insulation at critical points, have been reproduced in Fig. 2. A critical examination of these working drawings will show the generous use of

Fig. 1—An excellent type of a well insulated and carefully silenced composite body. Construction details are shown in Fig. 2 + + +



# Brings Forth Variety Methods

This is the second of two articles on body silencing, the first having appeared in the issue of April 4 + + +



there is a wood-to-metal or metal-to-metal contact.

Wherever metal-to-metal or wood-to-metal contact occurs, the rubbing surfaces are separated by a special type of friction tape. Originally, before such materials were commercially available, Murray Body used ordinary black friction tape for the purpose. The permanency and efficacy of friction tape is tested on a special fixture which reciprocates the sample between two blocks under pressure. The criterion in comparing samples is the number of strokes required to start squeaking. On the basis of this test they have just recently adopted a new material which is essentially a webbed fabric impregnated with a heavy grease or fat. This sample could not be made to squeak and the lubricating material did not break down when the sample was subjected to a steam test at 275 deg. Fahr.

Referring to the discussion of rumbling of door panels and body panels in the previous article, it is obvious that only isolated cases require deadening of door panels of Murray bodies. In fact, this operation is conspicuous by its absence at their plant. Adequate damping of all door and body panels results from the substantial wood frame, and the use of strainers wherever necessary; also because of the rigidity produced by the large turnunder. Wherever strainers are used they are lined with blue wadding or felt impregnated in the anti-friction compound.

Now here is an important hidden detail: At corners where body panels tend to curve away from the frame, felt bumpers or pads of wadding, depending upon the space, are tacked on the frame at strategic points and may come into play whenever some severe twist in the body tends to flatten the corner for an instant and

bring the panel closer to the frame. Door hinges on certain of the new Murray bodies have provision for oiling, this being a decided step forward in body silencing. In this construction the hinge pin is made with annular oil grooves which are fed through holes drilled in the body of the hinge.

After the body has been completely assembled, panels attached and ready for the metal cleaning operation, additional precautions are taken to protect exposed parts at the water deck. To this end it is their custom to apply aluminum paint on all metal parts not accessible for priming after assembly. Furthermore, all exposed wood parts, chiefly at the deck, are sprayed with a special waterproof sealer which serves as a wood preservative. General construction specifications for Murray bodies are given in Table 1.

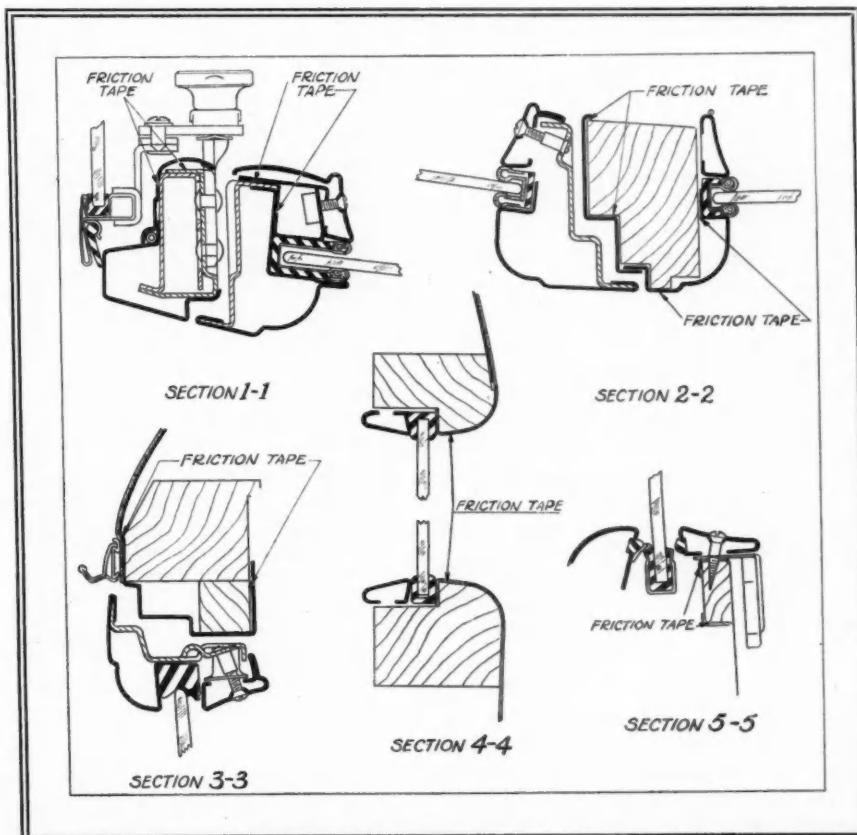


Fig. 2—All joints are bedded in anti-friction paste and wherever rubbing surfaces occur they are separated by a special type of friction tape

Due to fundamental differences in body construction, the Budd all-steel body requires silencing methods of another kind. The principal problem is that of eliminating vibration in body panels and doors. This is effectively done by spraying all body panels and the doors with a plastic deadener of emulsified asphaltum. In certain areas around the roof which cannot be reached by the deadener, damping is produced by pasting on pieces of Kersey cloth. Pads of Kersey cloth (jute felt) are also laid in the seat pans and serve as a deadener and insulation against heat and cold. Consistent with general practice the roof bows are lined with blue wadding as an insulator for the wire netting. Windshield glass is set in a special cork-fabric liner, the glass and liner being pressed into the frame on an air-operated fixture. To assure permanent protection, the rear window glass and the deck materials are set in with an oil base bedding putty which is said to remain resilient for the life of the car. This produces a waterproof joint having the additional feature of a cushioned frame which will not leak or squeak.

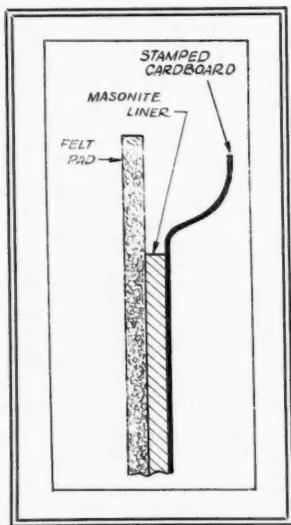


Fig. 3—The Chrysler dash is thoroughly insulated by a thick pad of soft jute felt to absorb noises from under the hood and a liner as protection against heat and cold + + +

products they have developed recently is a laminated fabric-and-rubber body shim designed to produce a resilient cushion effect without permitting body wiggle.

For studying the vibration in door and body panels, Chrysler engineers use the Lee Vibrecorder, which was completely described in *Automotive Industries*, April 4, 1931. As a result of the experimental work, Chrysler has specified the use of a vertical strainer on door panels with a felt wedge between it and the metal. The panel is sprayed with a plastic deadener as usual.

Chrysler dash insulation is thoroughly worked out, as will be evidenced from Fig. 3. First, the dash is lined with a thick pad of soft jute felt to damp vibration and absorb noises from under the hood. Next, comes a heavy pad of insulating material as a protection against heat and cold. Finally, for decorative effect, a pressed cardboard cover is used, which is made of thin waterproof cardboard in a Morocco finish.

The standard practice of the Hudson Motor Car Co., in insulating bodies from motor noise and so-called "rumble," is shown in fine detail in Fig. 4. The areas at A are insulated and damped by 20-oz. Kersey cloth pads, which are cemented with a waterproof cement to the panels. On the doors, this Ker-

sey cloth is additionally reinforced to assist silencing and to damp vibration by an adjustable steel brace lengthwise of the door which is forced against this pad and exerts pressure to the panel.

Letter B shows a  $\frac{5}{8}$ -in. jute pad reinforced with an embossed protective shield of fiberboard to hold it snugly against the dash. This dash pad B is made to fit securely around the joint of cowl and dash, overlapping approximately three inches onto the cowl surface.

At F is shown the rubber floor mat, beneath which and rubber-cemented to it, is a  $\frac{5}{8}$ -in. hair pad which is an excellent sound absorbing medium. In addition to the insulation around emergency brake, steering gear, clutch and brake pedal openings is a rubber shield at emergency brake and steering gear which clings to these units sufficiently close to prevent entrance of fumes or atmosphere at these points.

At G is an interesting detail consisting of a cotton roll which is forced between the cowl panel and sill to damp cowl vibration and close the opening at this point. The surfaces at both D and E are of laminated wood floorboard covered with carpet.

For deadening as well as absorbing noises, the roof construction C is made of a cotton pad, stretched over the roof bows, forming a quilt approximately  $\frac{3}{8}$  in. thick. A similar pad is used in each of the seat cushions.

In the construction of Auburn bodies, among other features, squeaking is prevented by the use of joints with large contact areas. And important joints between wood parts, or wood and metal braces, are provided with through bolts as well as wood screws. All contact between joints is properly insulated. The design of the steel members of the body and door frames, as well as the assembly of the various integral units composing the body frame, provides for complete box sections, steel joints being securely welded for rigidity and strength.

To further silence these bodies, the panels on the body and doors are sprayed with a thick layer of asphaltum type of body deadener. The dash panel is made of heavy (16-gage) steel with ribs of large cross section pressed into it. It is provided with a triple layer of insulation consisting of felt, Masonite and finished cardboard, forming an effective protection against heat, cold and sound. The front compartment is likewise provided with an extra heavy felt, rubber-covered mat in which all the cutouts fit securely to the projecting chassis parts.

On Studebaker bodies Mortex plastic deadener is

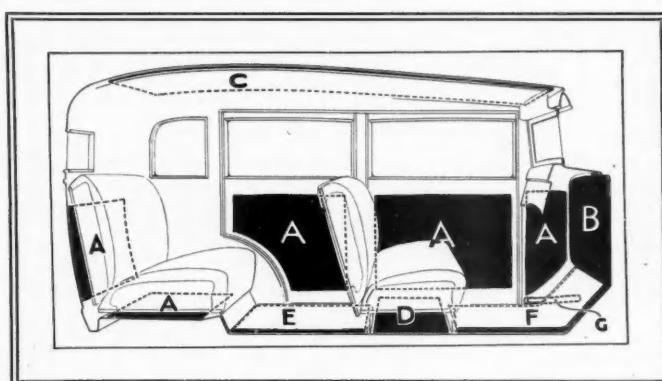


Fig. 4—Hudson bodies are protected from the so-called "rumble" by Kersey cloth cemented to the panels with a waterproof cement + + + + + + + + +

sprayed on the cowl sides, doors and rear panel of all President bodies and those of the Commander Brougham. It is used on Commander Sedans, Coupes and Victorias in the cowl sides only. It is not used on any Dictator or Studebaker Six models. The deadener is sprayed on to a thickness of  $\frac{1}{8}$  to  $\frac{1}{4}$  in. Felt pads,  $\frac{1}{2}$  in. thick, are applied on the toe and floorboards. The dash is lined with a sheet of Masonite  $\frac{1}{2}$  in. thick.

The body is mounted on the frame with wood fillers in the steel sills, to which are tacked rubber shims. The rubber serves as a frame insulator while the wood acts in an absorptive capacity. Points of contact between body and frame, such as pans to cross members, dust shields, etc., are protected with a layer of felt, scrap carpet, or other suitable material which may be available. Now here is an interesting thing: To prevent the metallic noise usually caused by the closing of the doors, the center or lock pillar trim construction on Hudson bodies is so arranged that the installation of the trim provides a filler of wood. This is said to be very effective. Doors are double weatherstripped at the bottom with felt and the tubular rubber. Fabric-covered windlace surrounds each door on the top, sides and wheelhouse.

One of the most interesting developments in this field is the adoption of the all-steel body construction by Briggs Mfg. Co., complete details of which will be published in *Automotive Industries* very shortly. Although the doors on this body design are of all-steel construction, a framing has been incorporated which effectively eliminates rumbling, so that no additional deadener or damping device is required. Roof bows are lined with blue wadding. On all metal-to-metal joints where there is any possibility of frictional contact, blue wadding is used as an insulating material. At the header, an anti-friction strip is employed to prevent squeaking.

Hayes bodies represent another type of composite

construction with an all-steel front. The most recent job was the Austin body which, in addition to considerable steel work in the structure, also features a single-piece, steel underbody. Some interesting problems were introduced with this construction, due to the fact that no floor boards or dash insulation were employed. Accordingly, considerable vibration was set up and, to overcome this effect, wood strainers were fastened under the dash and floor.

On the small Hayes commercial bodies, which have considerable flat panel areas, additional wood strainers are applied along the sides. Sponge rubber or blue wadding, depending upon conditions, is used as insulation between the strainer and the metal panel. Vertical strainers are used on door panels to prevent rumbling. In accordance with the general custom, roof bows are lined with felt as insulation for the wire netting.

The foregoing gives in brief detail some of the chief elements in the drive to produce bodies free from noise. As brought out in the first article on this subject, the general problem depends entirely upon the type of body and the details of its construction. When all the variables are considered, it is obvious that body silencing is a matter requiring engineering study. It is equally obvious that every time a change in body design or structure is made, the adequacy of the silencing methods should be questioned and thoroughly investigated.

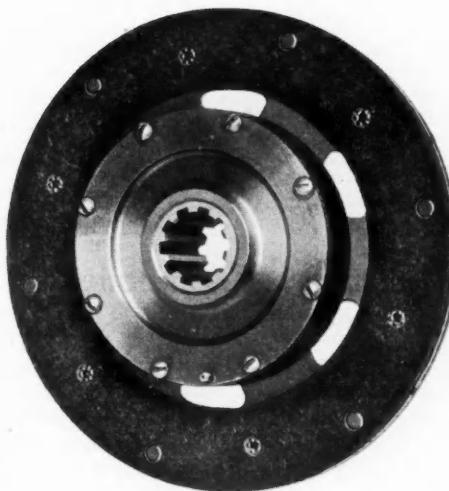
In concluding, we want to emphasize the desirability of investigating the new products which have become available in this field, among which are: The waterproof, non-glazing felts; cork products; wood preservatives; and the increasing variety of molded rubber applications. Door accessories are of vital importance in body silencing work and some new developments are promised in dovetail design. Needless to say, the dovetail is a very critical element and the designer must not overlook it when the problem of silent door construction is being considered.

## Free-Wheeling Unit Available for Model A Ford

ANNOUNCEMENT has been made by Sears, Roebuck & Co. that it is now offering a free-wheeling unit. This unit, which goes ahead rather than in back of the transmission, is at present being offered only for Model-A equipment, although similar designs for Chevrolet or other cars are now being worked on.

The unit consists of an overrunning roller clutch built into a drum riveted to the rear face of the clutch disk. The over-running clutch mechanism consists of but two large rollers, 180 deg. apart, which wedge between flat machined surfaces integral with the internally splined hub and the inner circumference of the enclosed drum.

The rear face of the drum has a bronze collar insert, and the bronze front face, which is attached to the drum by a number of screws and lockwashers, form the bearings for the hub. The unit comes ready assembled to a Ford Model-A clutch



Sears, Roebuck is offering this new Ford accessory, said to be the product of Muncie Gear Co.

disk, so that it can be inserted in place of the standard disk without other alterations.

Due to the location and design of the unit, it is not possible to lock out the free-wheeling clutch mechanism, the car free wheeling in all speeds, including reverse. The design, as do other free-wheeling mechanism, permits shifting between high and second gears without declutching. Depressing the clutch pedal is necessary only when starting up either forward or back.

With the design offered by Sears-Roebuck, lubrication is recommended every 1000 miles, for which purpose it is necessary to remove the clutch inspection plate, rotate the clutch disk to the proper position, and then lubricate the unit through a standard Zerk fitting, and a pressure gun extension which is furnished with the unit. List price is \$15.45.

The unit is said to be manufactured by the Muncie Gear Co. of Muncie, Ind., who also make similar devices for other makes of cars.

## Modulus of Elasticity Varies in Different Aluminum Alloys

In connection with certain parts in internal combustion engines and other mechanisms it is highly desirable that they change their shape as little as possible under stress within the elastic limit. This change in shape or elastic deformation under a given load depends upon the modulus of elasticity of the material. If the modulus of elasticity is low, correspondingly heavier sections of metal must be used. This applies particularly in connection with such parts as bearing caps.

Since practically all types of steel used in mechanical work, plain carbon as well as alloy, have substantially the same modulus of elasticity, engineers are apt to form the opinion that the same holds true of alloys of other metals. However, it was shown in a paper contributed to the recent meeting of the Institute of Metals at Chicago by R. L. Templin and D. L. Paul of the Research Laboratory of the Aluminum Co. of America at New Kensington, Pa., that there are considerable differences between the moduli of elasticity of certain aluminum alloys.

A value of 10,000,000 lb. per sq. in. has been quoted as representative of aluminum and its alloys. This value has been found to be approximately correct for pure aluminum and aluminum alloys in which the total percentage of the alloying elements is low, but seriously in error in the case of alloys that contain relatively large amounts of the alloying elements.

The results of the author's experiments on different alloys are given in the accompanying table.

Following are some general conclusions drawn from the results of the tests:

1. A general increase of modulus of elasticity results with the addition of iron, silicon, copper, nickel or manganese to aluminum.

2. In certain of the commercial aluminum alloys the modulus of

elasticity is increased as much as 20 to 30 per cent by the presence of considerable amounts of the metals mentioned above.

3. The results obtained indicate that copper, iron and nickel produce changes somewhat in the order of their respective modulus values, nickel having the greatest effect and copper the least.

4. The addition of silicon to aluminum results in an increase of modulus without any increase in the density of the metal.

5. In heat-treated aluminum-magnesium alloys the modulus of elasticity does not decrease until magnesium is present in amounts greater than about 12 per cent; in alloys that have not been heat-treated the decrease occurs in the region between 6 and 10 per cent magnesium.

6. It may be concluded from paragraph 5 that magnesium held in solid solution in aluminum does not have as great an influence on the modulus of elasticity as when it is present as a free constituent.

TABLE I  
Modulus of Elasticity Values for Some Cast Aluminum Alloys

Alloy	Modulus of Elasticity (E), Lb. per Sq. In.
A (13% Si)	11,100,000
B (14% Si, 1.15% Cu, 2.5% Ni, 1% Mg)	12,000,000
C (10% Cu, 1.25% Fe, 0.25% Mg)	10,800,000
D (12% Cu)	10,800,000
E (12% Cu, 0.75% Mn)	11,000,000
F (5% Cu, 6% Si)	11,000,000
G (8% Si, 4% Cu, 4% Ni)	11,600,000
H (10% Cu, 4% Ni, 1% Mn)	11,700,000
I (7% Si, 7% Cu, 7% Ni)	13,000,000
J (10% Si, 10% Cu, 4% Ni)	13,300,000

## 149 Assembly Plants Supply American Automobiles

(Continued from page 618)

duced in 37 cities, in 24 of which part of the manufacturing operations are also carried on. These 24 cities are distributed among nine states.

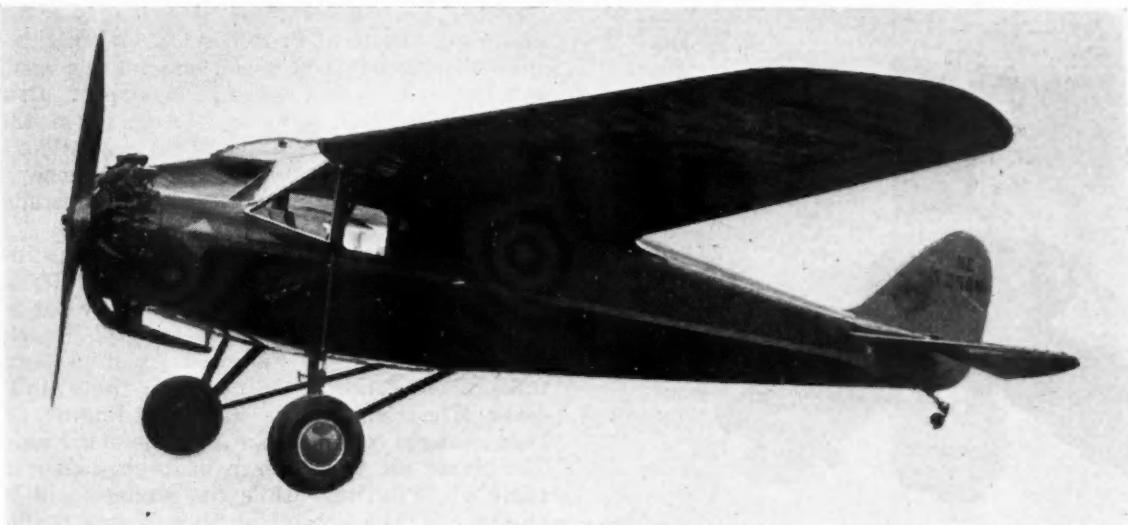
In the foreign assembly field, cars are assembled in 23 different countries on every continent on the globe. Canada leads with 13 plants, with Australia coming a close second with eleven plants. Taken by continents, however, and excluding the United States, Europe leads with 21 plants, with Australasia, including Australia, New Zealand and the Dutch East Indies, having 16 plants.

American investment in overseas operations represents well over \$200,000,000. While complete figures are not available, a recent survey conducted by the

Department of Commerce showed that American capital was invested in automobile plants in Europe to the extent of \$79,210,000, and investments in Australia were \$31,122,000. Figures obtained from the Canadian government show investment in plants assembling American cars of \$98,378,000. No figures are available for investments in Asia and Africa.

In addition to the overseas service plants already listed for Ford, which were formerly given as assembly plants, he has four service plants; Willys-Overland also has 18 service plants scattered throughout the world.

Ford also has four service plants within the confines of the United States.



The Swanson "Coupe" is one of the new ships exhibited at Detroit. Note that the wing is a full cantilever. The powerplant is a Kinner

## Late Arrivals Make Total of 42 Airplane Displays at Detroit Show

by Athel F. Denham

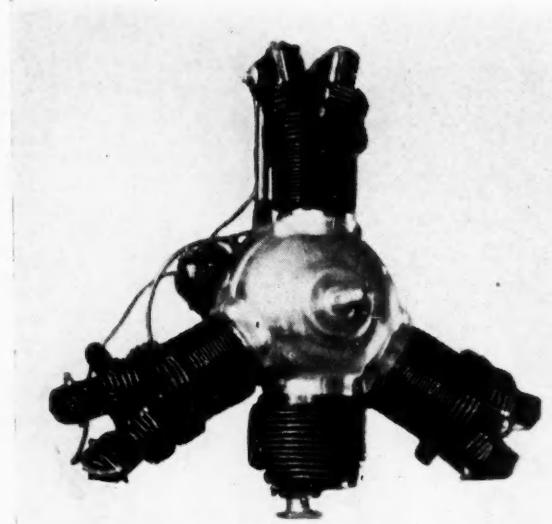
WITH the final exhibitors' list calling for 82 airplanes to be exhibited by 42 airplane manufacturers, the National Aircraft Show lacked numerous exhibits scheduled for it when the gates were thrown open to the public. Some of the planes are expected in Sunday or Monday. A few have met with minor mishaps on the way to Detroit, as was the case with the Bird cabin biplane. In addition to the planes housed within the exhibition, some hundred planes were in evidence on the airport.

From early indications, popular interest centered evidently about the three autogiros exhibited by Pitcairn, these being of the new small type, and William B. Stout's Sky Car. These, as well as most of the new airplanes and aircraft engines exhibited at Detroit, have been previously described in these columns. Some few additions remain to be made to the list. Rearwin Aircraft brought to the show a new light plane powered with a Poyer, 45-hp., three-cylinder radial, of which more anon. Bellanca exhibited its new transport sesqui-plane. The

latter has a lower "wing" in the shape of a shallow V, with the landing wheel on each side carried in the apex. The inner leg serves as a brace to the fuselage, while the outer leg braces the semi-cantilever monoplane wing. With this design an unusually wide tread has been worked out for a plane of its type.

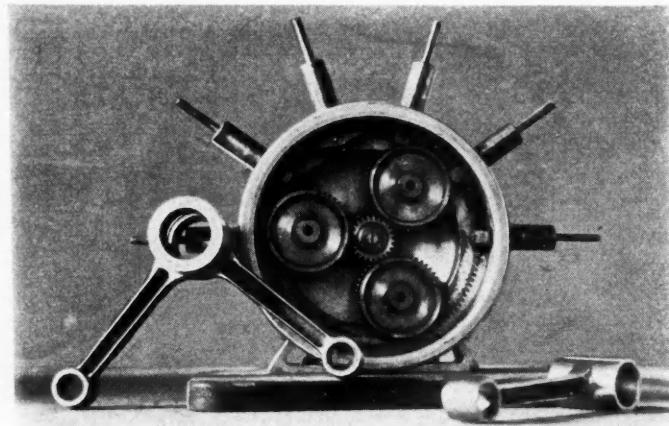
Photographs of some of the other new ships accompany this article. These include the Swanson Coupe, a cantilever monoplane powered with a Kinner engine; a two-place amphibion by Amphibions, Inc., with a pusher engine; the Ford Motor Co. latest development from the 5-AT, a single-engined (water cooled) transport, and the Curtiss-Wright Junior.

In last week's *Automotive Industries* (April 11) the most of the exhibits at the National Aircraft Show were described. In this article, it is the intention of the author to complete the account + + +



Another newcomer in the light or small horsepower aircraft engine field is the Poyer three-cylinder, rated at 45 hp. at 2500 r.p.m.

Details illustrating the design of the Poyer engine. All three connecting rods are the same length. They are shown here with the master rod removed to show the construction. An adaptation of the planetary valve gear, shown here, is used in the engine



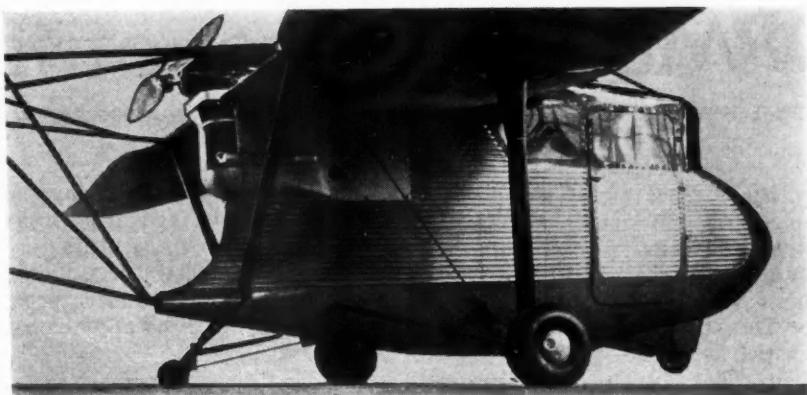
Wheel fairings are now reaching even the so-called power gliders. This photo shows the Aeronca which has been redesigned to seat two side by side. Note the neat engine installation

Another controllable pitch propeller is exhibited by Hamilton Standard Propeller Co. In this design, engine oil pressure serves as the actuating medium. A number of new developments in airport, airway, and airplane lighting equipment were given their first public showing. Western Electric exhibited a new airplane radio set, a 10-watt, high-frequency, crystal-controlled transmitter, designed for installation in itinerant planes.

Announcement has been made of changes in the corporate structure of the Aviation Corp. With the acquisition of the manufacturing facilities of the Fairchild company, and its planes and engines, and the establishment of the Fairchild Aviation Corp. as an independent concern, the names of the Fairchild Airplane Mfg. Co. and the Fairchild Engine Corp. has been changed to American Airplane and Engine Corp. The planes are to be known in future under the trade name of "Pilgrim," while the engines will be called "Ranger." The exhibit at Detroit was confined to a "Ranger" six-cylinder, inverted, air-cooled engine (formerly the Fairchild 6-390). Two planes were on the field during the show.

The Poyer 3-40 engine, designed by Guy R. Poyer Aircraft Engine Co., Kansas City, Mo., is designed for use in light planes. It is of the three-cylinder, air-cooled type, with wet sump and finned crankcase, and is rated temporarily at 45 hp. at 2500 r.p.m. It incorporates a number of interesting features. Cylinder barrels are screwed into the split crankcase and fastened with a lock ring, so that compression ratio is adjustable in service. The valve gear is of the planetary type, drums on the planet gears actuating the "cam" followers by a virtually rolling rather than sliding ac-





William B. Stout's Sky Car vied with the autogiros in popular interest. This close-up shows the wheel under the nose. Noseovers are minimized with the design. Note that propeller is completely surrounded by the framing carrying the tail surfaces

**Stainless steel exhaust manifolds, said to be heat and corrosion-resistant, are exhibited by the Metallurgical Laboratories, Inc.**

tion. Cylinder barrels are conventional, finned steel, with dural heads.

The connecting rod assembly is symmetrical, and consists of three rods of equal length, equal weight, and each rod operates about the center of the crankpin to produce equal piston travel and correct timing for both valves and ignition for all three cylinders. A photograph of the disassembled rods illustrates the design somewhat more clearly.

Valve rocker boxes are enclosed and double valve springs are used. Anti-friction bearings are used extensively, including the mounting of the planetary valve gear. There are no external oil lines except the pressure gage. The oil is drawn into the pump through an oil passage cored integral with the crankcase and delivered directly into the crankshaft. The pump itself is mounted on the outside rear of the case. Oil pump and magneto drive gears are splined on the crankshaft extension. The crankshaft itself is of the two-piece type, for ease of assembly, in spite of the use of a split case. Dual ignition is optional at present. Bore and stroke is  $3\frac{1}{8}$  by 4 in., and weight dry is claimed to be only 125 lb.

Stinson Aircraft Corp. exhibited their new five-passenger amphibion plane, powered by two Lycoming engines, and listing at \$14,900.

Interest at the Bellanca exhibit centered around its 12-passenger Airbus, powered by a Wright Cyclone.

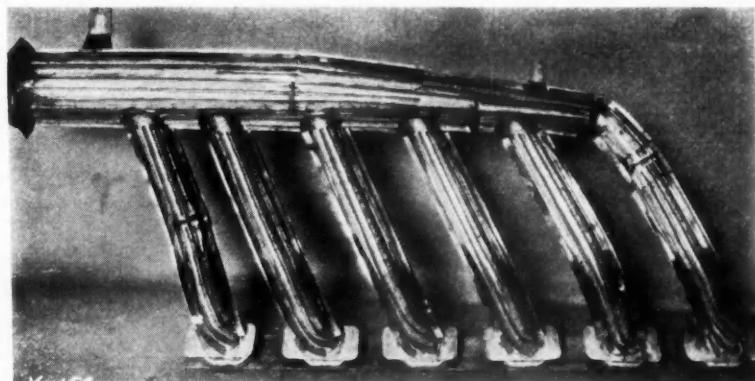
At the display of the Bird Aircraft Co. was included a Jacobs engine.

The Cloud Coupe Aircraft Corp. exhibited a two-passenger closed cabin plane at \$1,850.

Buhl Stamping Co. exhibited a line of radial engine cowlings and exhaust collector rings.

An ice warning indicator was shown by the Moto Meter Gauge and Equipment Corp.

The Fairchild exhibit consisted of a Kreider-Reisner, two-place, open biplane, powered with a Rover engine.



## Instalment Selling Outrides the Depression

*(Continued from page 608)*

consumer mortgages too large a part of his prospective income in deferred payment obligations; the implication is that these debts would have to be paid off to a large extent before the country as a whole could return to prosperity.

Data computed from reports of the 492 companies above mentioned would indicate that there was not any great increase of instalment obligations during 1929; the decrease in commitments since then has hardly been sufficient to cause much upsetting of business conditions as a whole.

A curve representing all instalment outstandings would be relatively flatter than most curves showing some phase or other of business conditions.

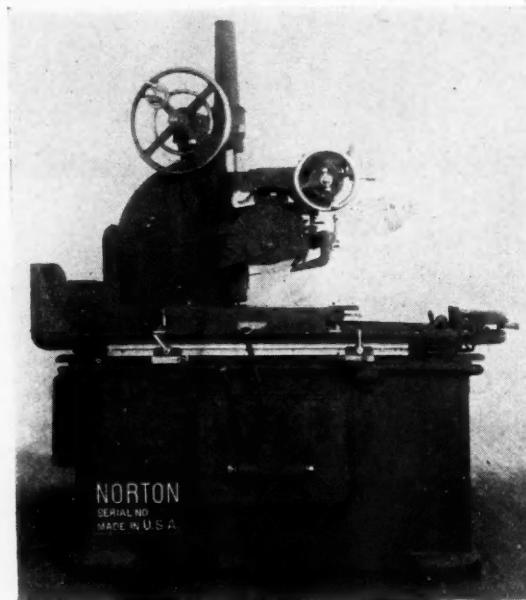
Because the volume of instalment selling outstandings varies only moderately and slowly as compared with the characteristic sudden and large movements of the common indexes of business during the periods from extreme booms and depressions, there would seem to be no indication to support the contention that deferred payment purchases are a considerable factor in either throwing the country into a slump or in materially aiding to bring about business recovery.

# NEW DEVELOPMENTS—AUTOMOTIVE

## Norton Surface Grinder

A HYDRAULIC Surface Grinding Machine, 10 x 12 x 24 in., intended for general tool room and production work, has been added by the Norton Co., Worcester, Mass. The cutting is on the periphery of the wheel, which is said to produce a straight line velvet finish. The controls are closely grouped and centralized lubrication has been installed for all of the important bearings. The table reciprocation is smooth and speedy and is hydraulically operated. The wheel feed is hand controlled with an index graduated for 0.0025 in. Wheel traverse is also hand operated with one speed for grinding and another for truing. Hydraulic wheel traverse is also available on special order. The wheel spindle is mounted on ball bearings and is found especially desirable on work with an interrupted surface.

Capacity without a magnetic chuck is 10 in. wide by 12 in. high by 24 in. long; with the

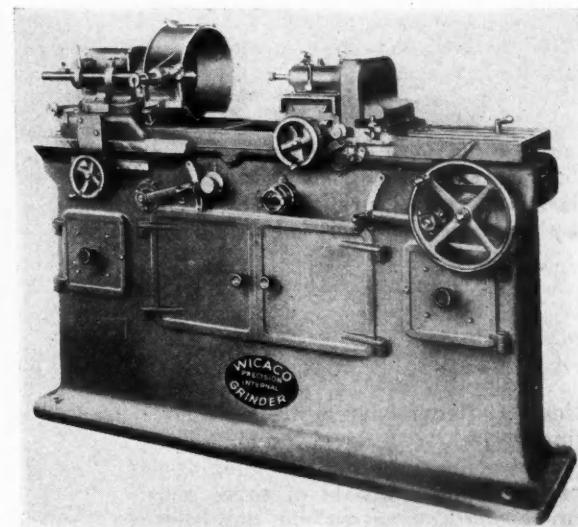


chuck, the height is reduced to 9 1/4 in. The floor space required is approximately 60 x 96 in. The weight is 5500 lb. net. The grinding wheel is 10 x 1 1/2 x 3 in. Motor required is 7 1/2 hp. at 1200 r.p.m., with standard frame specifications.

## Wicaco Internal Precision Grinder

A PRECISION GRINDER for work requiring close tolerances has been placed on the market by the Wicaco Machine Corp., Philadelphia, Pa., after about five years of operation in their own plant. One of the features of this new machine is the underslung drive consisting of individual motors for driving the work head and

wheel drive, hung directly under the carriage so that the ways rather than the head absorb the torque. To further insure accuracy, this machine is provided with a patented water jacketed wheel head which, according to the manufacturer, can be operated continuously with no appreciable rise in bearing temperature.



The wheel head is mounted on the upper of two cross slides which provide both automatic and hand cross speeds. The automatic cross speed can be raised by 0.0002 in. from 0 to 0.001 in. per stroke. Sixteen wheel and spindle speeds are available without changes in pulleys. The carriage is driven by a variable speed motor with a rheostat control providing sixteen speed variations from 20 to 60 in. per minute. The machine is a self-contained unit combining all accessories, including a diamond wheel truer.

Required floor space, 78 x 29 in.; net weight, 2400 lb.

## A New Hydraulic Rougher for Spiral Bevel Gears

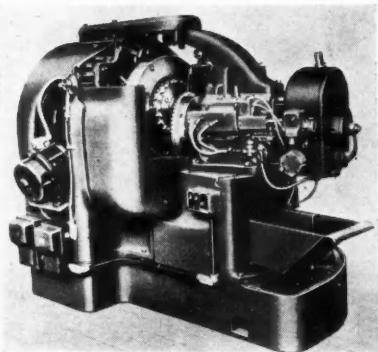
NEW standards of speed for rough cutting spiral bevel gears are said to be achieved by the hydraulically operated rougher, recently placed on the market by the Gleason Works, Rochester, N. Y.

The most noticeable feature of the machine is that it is fully automatic in operation, all movements being effected hydraulically. Special safety features are embodied in its design to minimize the danger of breaking the cutter, while the operation has been made as nearly foolproof as possible. The machine is rigid in design. The housing in which the cutter spindle is mounted is bolted directly to the base of the machine while the work spindle housing is securely bolted directly to the frame of the machine. An over-

# PARTS, ACCESSORIES AND PRODUCTION TOOLS

head tie between the two heads adds to rigidity. The motors are mounted in the machine and coupled direct. The control valve and electrical switches are all grouped in a convenient location

for the operator. This rougher has been designed especially for use in connection with the Gleason spiral bevel gear generators. Gears are first roughed on the new ma-

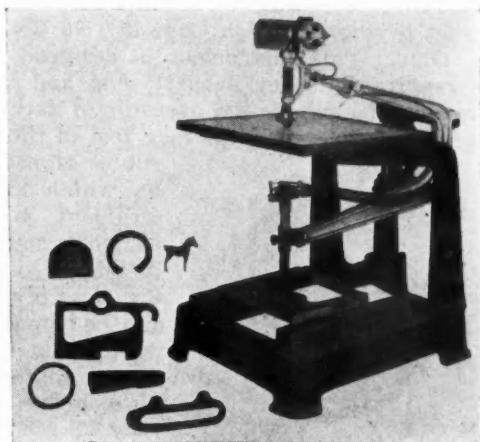


chine, then finished on the generator.

This machine is automatically lubricated and conveniently located sight glasses are provided for checking the quantity of lubricating oil. Pressure for the hydraulic system is supplied by an individual unit contained in the machine. This unit is driven by a separate motor which also drives the coolant pump. Standard 9 in., 12 in., 15 in., and 18 in. Gleason roughing cutters are used on this machine. Blades for these cutters are furnished in sets so that the heads can be refilled without returning them to the factory.

This rougher is arranged for motor drive only. A standard N.E.M.A. 5 hp., 1800 (or 1500) r.p.m. constant speed motor is used for the cutter drive and can be supplied by the customer or furnished with the machine. An individual 3 hp., 1200 (or 1000) r.p.m. standard N.E.M.A. motor is required for the hydraulic unit and coolant pump.

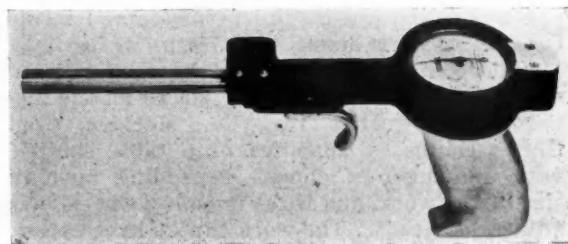
from a cutting area of 18 x 18 in. to 62 x 30 in. The tracer head may be either hand or automatic, depending upon the nature of the work. The automatic head is recommended for repetitive work and is used in conjunction with a pat-



ented flexible templet and inserter. The speed of the tracer head is controlled by a small electric motor, 1/50 hp. capacity, the speed of which is varied by means of a sensitive governor and quick-change gears. Current consumption and the cost of gas are said to be almost negligible.

## Federal Cylinder Test Gage

INSIDE diameters ranging from  $\frac{1}{4}$  in. to  $1\frac{1}{2}$  in. are said to be readily gaged by means of the new model 165 cylinder test gage recently introduced by the Federal Products Corp., Providence, R. I. It is designed to provide an accurate means of measuring small holes for bench inspection and, while the work is in grinders, screw machine or lathes.



This gage is fitted with two point contact interchangeable gaging plugs which come in standard lengths as follows:  $\frac{1}{4}$  to  $\frac{3}{8}$  in. diameter  $2\frac{3}{4}$  in. long;  $\frac{3}{8}$  to  $\frac{5}{8}$  in. diameter  $3\frac{3}{4}$  in. long;  $\frac{5}{8}$  to  $1\frac{1}{2}$  in. diameter  $5\frac{1}{4}$  in. long. The dial indicator is graduated in 0.0001 in.

## Flame Cutting and Profiling Machine

TOOL and die-making departments, as well as experimental shops, will be interested in the Hancock-Croydon flame cutting and profiling machine which is being introduced in this country by the American Oxycop Co., Detroit, Mich. This machine cuts, shapes and profiles steel plates and bars up to 8 in. thick rapidly and with a thoroughly clean finish which appears to be superior to the ordinary roughing operation.

The machine consists essentially of the hand guided, electrically driven tracer head which is made to follow the outline of a drawing or blueprint laid on the table. The work is located at the bottom and is processed by means of the patented cutting burner of remote control type, using oxygen and coal gas or oxygen and ordinary illuminating gas piped directly from the city supply lines.

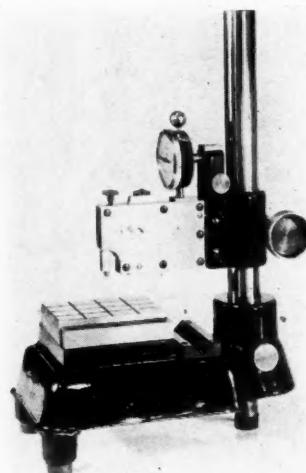
This machine comes in several sizes, varying

## NEW DEVELOPMENTS

### Automotive Parts, Accessories and Production Tools

#### Precision Amplifying Comparator

OPERATIONS of measuring and gaging are said to be greatly facilitated by the new amplifying comparator, recently placed on the market by the Precision Gage & Tool Co., Dayton, Ohio. This instrument is designed to fill the requirements for general shop and inspection use. To relieve the operator of fatigue in measuring small work, the rear foot of the three rubber-tipped feet on which the instrument is supported is made adjustable so that the entire unit may be tilted backward, thus bringing the platen and the work into clear view.



One of the chief features of this comparator is that it contains only two moving parts which are entirely inclosed in a dust-proof case. The amplified movement of these two elements is registered on the dial indicator graduated to read in half-tenths. There are no operating springs, and the action is said to be both sensitive and rapid. The entire unit is mounted on a base 6 x 10 in., having a hardened and ground vertical post about 16 in. in height. The measuring range when the work is placed on the platform is from 0 to about 8½ in.

#### Cipco Polishing and Buffing Machine

POLISHING and buffing of metal and molded parts having a diameter of 7½ in. or less is accomplished by a new method on the Cipco polishing and buffing machine, recently placed on the market by the Curtiss Way Co., Meriden, Conn. This machine is composed of a table equipped with a number of chucks, depending upon the size of the work, and three finishing wheels, with adjustable heads. The work chucks have expanding and contracting jaws which are operated automatically by gears. Just before the work comes into position for polishing, the jaws expand, holding the work securely. The table top revolves intermittently, allowing sufficient time for the work to contact the wheel. When the work has made a circuit of the top, it is in front of the operator ready for removal and reloading.

The three finishing wheels operate simultaneously. They are individually driven and mounted on upright jacks, readily adjustable for any desired working condition. The speed of the wheels and control of the machine are regulated by an electrical system, consisting of a starting switch,



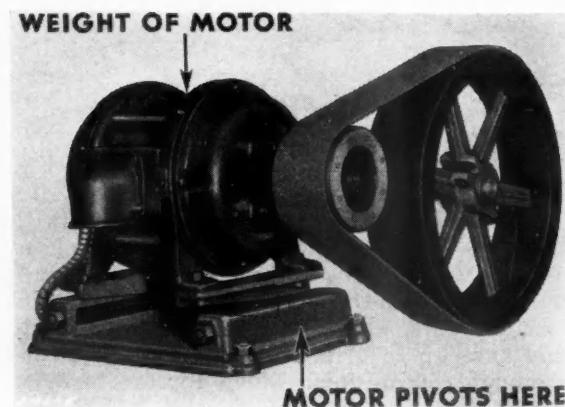
a four-speed control box and push-button switches for emergency starting and stopping.

The wheel motors are of 4 hp. capacity, 1800 or 3600 r.p.m., for either 220 or 440 volts. The table driving motor is a multi-speed constant torque of the same horsepower and rating.

#### New Rockwood Short-Center Flat Belt Drive Announced

AN important development in the power transmission field is announced by The Rockwood Mfg. Co., Indianapolis, Ind. (Division of General Fibre Products, Inc.), with the introduction of the Rockwood Short-Center Flat Belt Drive, now available in stock drives from 1 to 50 hp.

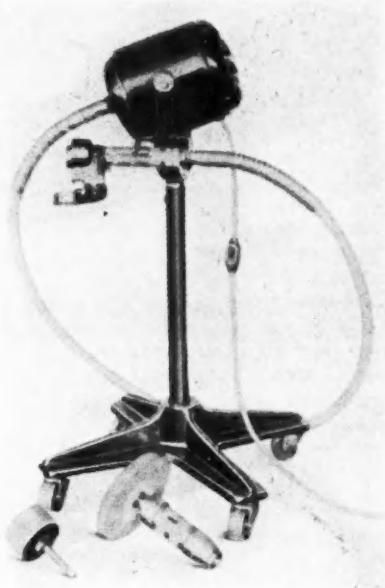
The Rockwood Short-Center Drive comprises a



Rockwood motor base, two Rockwood pulleys and a Rockwood-approved flat leather belt. The stock drives are designed for polyphase 60-cycle A.C. motors of any make. In this drive the motor is mounted on a free-swinging pivot and the weight of the motor is said to maintain uniform belt tension at all times. The correct belt tension, once established for any drive, is said to be unchanged by belt stretch or by centrifugal force.

## Biax Sheet Metal Shear

**S**HEARING of 16 ga. stainless steel, 14 ga. sheet iron, and 12 ga. brass and aluminum is said to be done with facility by means of the line of portable shears recently introduced by the Biax Flexible Shaft Co., Inc., Long Island City, N. Y. The shear handpiece type S is ball-bearing throughout, and has one-piece housing of small dimensions. Cutting jaws are of special

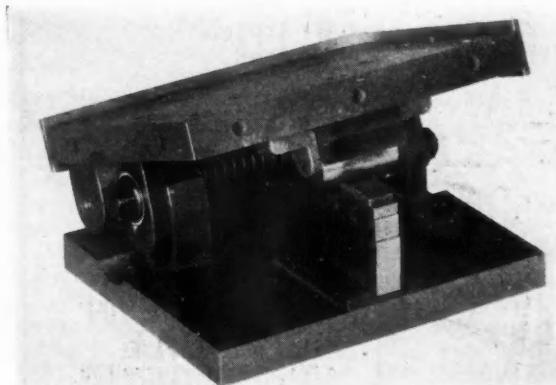


steel, easily interchangeable. This handpiece may also be used on the Supra Biax units.

The type 811 (illustrated) is equipped with a  $\frac{1}{2}$  hp. ball-bearing motor, 3600 r.p.m., suitable for 110-volt, A.C. 60 cycle. Type 851 has the same equipment but is used overhead, suspended by a portable trolley.

## Krag Sine Angle Plate

**A**SINE angle plate employing precision gage blocks has been placed on the market by Franz K. Krag, Chicago, Ill. It consists of two elements hinged together and so arranged that



the one may be clamped at any angle between 0 and 45 deg. with respect to the other. The bottom element is provided with an accurately

## NEW DEVELOPMENTS

### Automotive Parts, Accessories and Production Tools

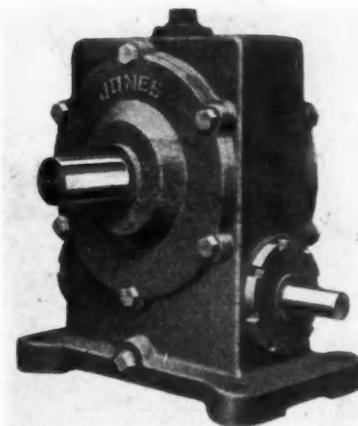
ground, hardened and lapped anvil; the upper element with a ground, hardened and lapped cylindrical surface. These two elements constitute the working surfaces between which the precision blocks are placed; the space between them comprises the sine of the angle. The distance between the center of the shaft and the center of the cylindrical face is exactly 3 in. When using precision blocks, any angle can be obtained within 0.0001 in. in 3 in.

No surface plate or height gage is required for setting up. When the proper blocks are used the sine of the angle is accurately indicated within the limits of accuracy of the blocks. The units are available in two models, namely, Model "S" of hardened steel throughout and Model "C" of cast iron, with hardened, ground and lapped shaft and bushings.

## Jones Worm Gear Reducers

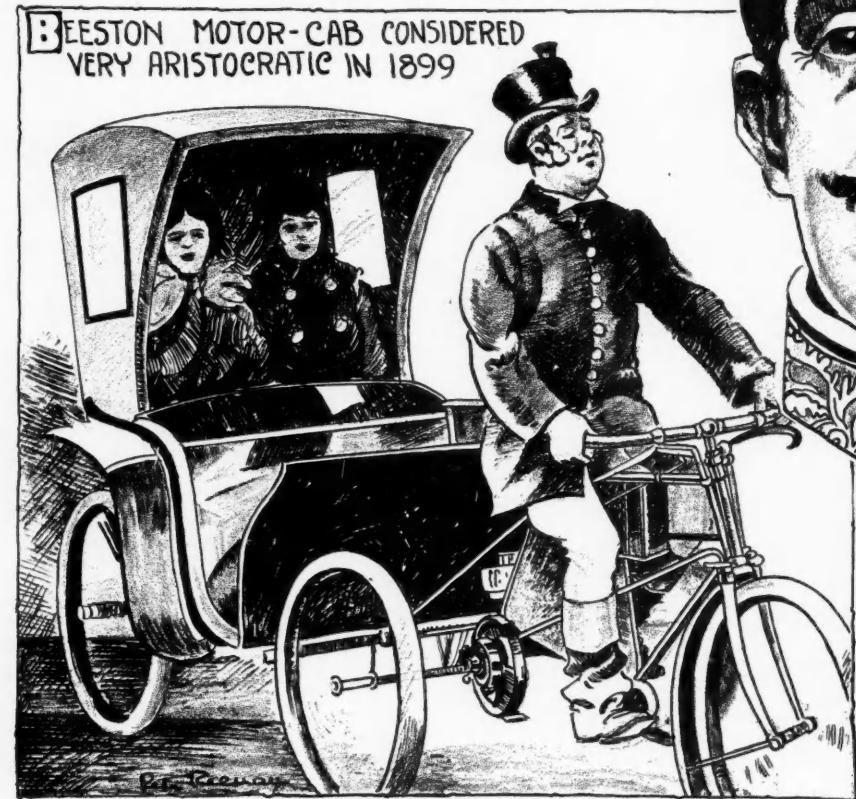
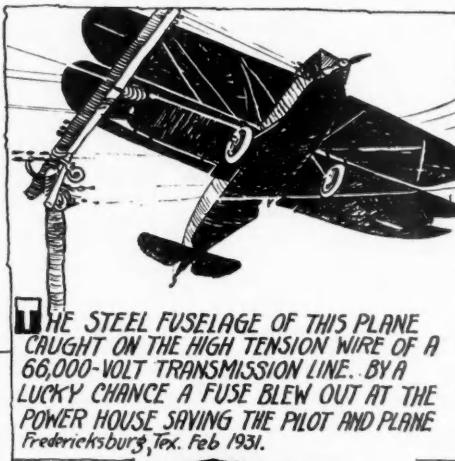
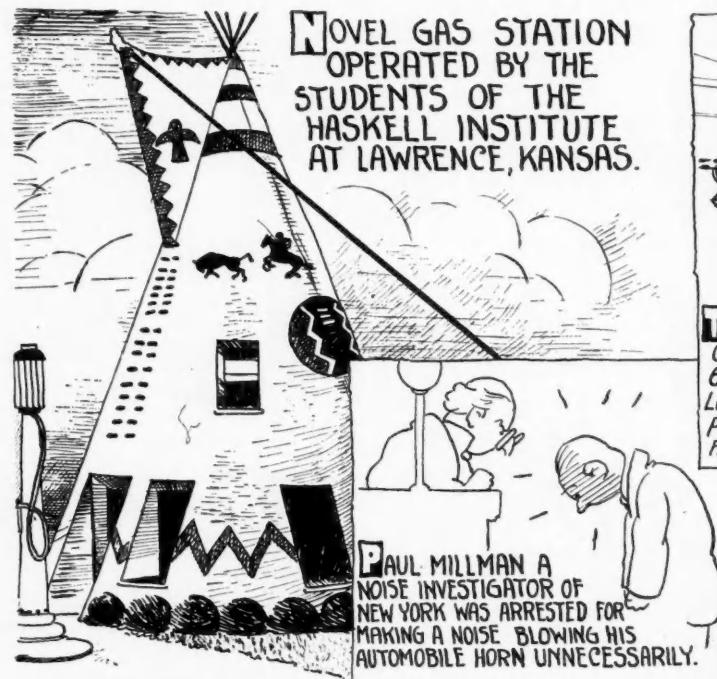
**A**SERIES of three worm-gear speed reducers for small electric motor drives—up to 7 hp. capacity—have been developed by the W. A. Jones Foundry & Machine Co., Chicago, Ill.

These small reducers are almost identical with the heavy-duty Jones worm-gear speed reducers, except in size. The worm is made from a low-carbon, nickel steel forging that is hardened to increase strength and wearing qualities. The

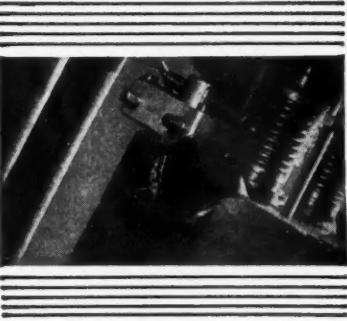


wheel is made of a nickel phosphor bronze alloy. The gear blank is dry-sand cast and chilled, producing a casting of exceptional strength and load-carrying capacity with a minimum of friction, it is claimed. The teeth are generated by hobs. The gear shaft, a high-carbon-steel forging, extends out on both sides of the housing so that machines can be driven from right or left-hand side or both. A metal cap, or shaft guard, covers one shaft and is easily removed. Both the gear shaft and the worm shaft are mounted on Timken roller bearings.

# Automotive Oddities—By Pete Keenan



**K**ING ALFONSO ONCE SAID THAT IF EVER HE WAS FORCED TO QUIT THE THRONE, HE WOULD BECOME AN AUTOMOBILE MANUFACTURER.



# NEWS OF THE INDUSTRY



## Warns Against Aero Sales Cycle

Light Planes May Pass  
Out Again, is View

DETROIT, April 16—Pointing out that the reentry of a large number of airplane manufacturers into the light airplane field is due mainly to the realization of the impossibility of selling recent airplane types to private owners, Robert Insley, vice-president and general manager, Continental Aircraft Engine Co., warned the industry that these planes would again pass out with the swinging cycle unless serious attention is given to what should constitute a light airplane. His remarks were made at the aircraft engine session of the Society of Automotive Engineers held here yesterday.

Mr. Insley said that there appeared to be two classes of demand in light planes, one calling for safety at low cost, and the other high performance with safety. He felt that the former needed about 35 hp. and the latter roughly 50, for two passengers. He also suggested that in the 50-hp. size the propeller might well be driven from the camshaft rather than crankshaft, thus obtaining more tractive efficiency at a sacrifice of cooling cost and weight.

(Continued on page 637)

## Continental Adds Line

DETROIT, April 16—Continental Motors Corp. has developed a new line of truck and bus engines of the six-cylinder, L-head type. These engines, known as E600, are of 4½-in. stroke and bores ranging from 3 11/16 in. to 4 1/4 in. They do not supplant any present models. Deliveries will be made shortly, according to L. J. Kanitz, general sales manager. Names of purchasers to whom it is expected to make deliveries of the new engines were not disclosed in the announcement.

AT 9 o'clock on Tuesday morning (April 14) the twenty-millionth Ford automobile left the assembly lines at Dearborn in the presence of Henry and Edsel Ford and high officials of the company. About a month ago the Ford plants in Canada produced their millionth unit. Milestones: No. 2,000,000 was assembled in June, 1917 (No. 1,000,000 had been produced in December, 1915); No. 5,000,000 came in May, 1921, and No. 10,000,000 in June, 1924. In May, 1927, Henry and Edsel Ford proudly drove about in No. 15,000,000 and a lot of people in these U. S. initiated conversations beginning "even if they had only made \$5 on each car \*\*\* Charles F. Kettering, G. M.'s master of new developments, was the principal speaker at a meeting of the Michigan Section, Society of Illuminating Engineers . . . how many of them are \*\*\* the De Vaux plant at Oakland, Calif., was slated to open on the 15th \*\*\* a well-known racing driver has been touring the country on the payroll of one of our larger manufacturers of automobiles, demonstrating that manufacturer's cars, and having his picture appear here and there as a booster for the car . . . we'll probably never know how it happened that this racing driver had his picture taken, grinning widely, and standing in front of a car manufactured by another company, which competes with the first in an important price-class . . . but so it happened, and the second company sent out a lot of photographs with an accompanying caption describing how their car had received the unstinted praise of the racing driver . . . then someone called the attention of the second company to the fact that the racing driver was still on the payroll of the first company . . . well, well \*\*\* Adoption of a scientific traffic code in Chicago has brought about a 33 per cent increase in the volume of traffic the central business district of the city is able to handle, according to the Erskine Bureau at Harvard \*\*\* the exhibits at the Patent Exposition in Chicago this week included an automobile, which if turned over, automatically shuts off the ignition to prevent fire, and keeps sounding a special horn for aid \*\*\* Boeing System of Air Lines has completed a dicker with the Western Union making tickets for the lines available through any W. U. office \*\*\* Amelia Earhart has bought a Franklin \*\*\* Dr. Paul Heylandt, who was in the news couple weeks ago with a new liquid air-alcohol engine, is now in the U. S. \*\*\* Baltimore councilman introduced anti-parking legislation in city council because he "found the bill on his desk" . . . so that's how automotive legislation is made \*\*\* now, after 25 years, electric passenger cars have got around to looking like automobiles again \*\*\* Herbert Hosking.

THE  
NEWS  
TRAILER

## Houdaille-Hershey Sales Show Gain

Company Elects  
New Officials

CHICAGO, April 16—March sales of Houdaille-Hershey Corp. were nearly 40 per cent greater than February, and the month was the best the corporation has had in some time, Claire L. Barnes, president, told stockholders at annual meeting yesterday.

Following the stockholders' meeting all retiring officers were reelected with exception of Melvin B. Ericson and Charles F. U. Kelley, retiring as vice-presidents and directors, and A. E. Lowry, treasurer. M. D. Harrison, vice-president, was elected treasurer and Sanford Brown was elected a director.

## Executives to Confer

PHILADELPHIA, April 18—Next Friday, April 24, a committee of motor truck manufacturers of the National Automobile Chamber of Commerce will meet with a group of presidents of Eastern railroads for an informal conference to discuss the various problems of transportation coordination now facing both industries.

The truck group will include A. J. Brosseau, chairman of the N.A.C.C. Motor Truck Committee, and president of Mack Trucks, Inc.; Alfred P. Sloan, Jr., president, General Motors Corp.; R. P. Page, Jr., president Autocar Co.; Ashton G. Bean, president White Co., and Alfred H. Swayne, vice-president General Motors Corp.

## Chrysler Shifts Knob

DETROIT, April 18—Cliff Knoble, who has been director of advertising of the Chrysler Motor Corp., has been appointed director of advertising of the Chrysler Sales Corp. He will continue to direct the advertising of the Chrysler Motor Corp.

April 18, 1931

## Men of the Industry and What They Are Doing

### Swayne Cites Gains

While in Brownsville on his way to Mexico where he will make an extensive tour, Alfred H. Swayne of New York, vice-president of the General Motors Corporation, said in an interview that the automobile industry is "actually or rapidly approaching a condition of convalescence." Mr. Swayne is making the trip as the guest of Daniel Upthegrove of St. Louis, president of the St. Louis Southwestern Railroad, of which he is a director. They are traveling in Mr. Upthegrove's private car. During his visit to Monterey, Mexico City, Guadalajara and other cities of Mexico Mr. Swayne will make close inquiry into the automobile trade and its possibilities.

### Mitchell Appoints

Ernest K. Williams has been appointed sales engineer of the automotive standard equipment division of the Mitchell Specialty Co., Philadelphia. Until recently he was sales engineer of the English and Mercer Co. I. T. Gillian, formerly sales manager of Mitchell, has resigned.

Other announcements from Mitchell include the appointment of C. W. Moore to head engineering activities, to replace F. W. Kulicke, and assumption of advertising duties by E. A. Berger, who will have the title of advertising manager. R. J. Schaffer has been placed in charge of the company's Detroit sales office.

### Olds Names Spalding

Henry W. Spalding has been appointed San Francisco zone manager for Olds Motor Works, succeeding F. G. W. Sudrow, who resigned because of ill health, according to J. T. Collins, general sales manager.

Mr. Spalding has been located on the Pacific Coast for the past three years and prior to that time was manager of the Chevrolet Motor Co.'s retail store in St. Louis, Mo.

### Lantz Sails for Europe

William S. Lantz, manager truck and marine engine sales for Chrysler Export Corp., sailed April 3 for an extended trip through Europe in the interest of truck sales activities on the continent.

### Wade and Adams Combine

Fred A. Wade and Floyd W. Adams have recently opened a sales agency at 2-163 General Motors Bldg., Detroit, Mich., specializing in the sale of automotive products.

Mr. Wade was one time director of

purchases of Buick Motor Co., serving under Walter P. Chrysler. He acted in the same capacity for 10 years with the Studebaker Corp.

Floyd W. Adams handled sales for the Victor Mfg. & Gasket Co. for eight years; was sales manager for the equipment division of the Biflex Products Co. for five years and for the last two years has been sales manager of Owen-Dyneto Corp.

### Graham Names Carter

C. W. Matheson, general sales manager of the Graham-Paige Motors Corp., has announced the appointment of John W. Carter as director of used car sales promotion, a newly organized division of the sales department. In 1928, when C. W. Matheson was made vice-president in charge of sales of the De Soto Motor Corp., Mr. Carter was appointed to direct De Soto used car merchandising.

### Kelsey-Hayes Elects

At the annual meeting of stockholders of Kelsey-Hayes Wheel Corp., held April 7, F. S. Kennedy, H. Edgar Lewis and Joseph A. Sweeney were elected to the board of directors, succeeding Rodman C. Griscom, Howard P. Ingels, and Henry A. Rudkin, resigned. A successor was not elected to fill the vacancy created by the resignation of W. J. K. Vanston.

### Ralph Evinrude Elected

Ralph Evinrude has been elected a member of the board of directors of the Outboard Motors Corp., it is announced. He is the son of Ole Evinrude, originator of the outboard engine, and president of the company, and has been associated with the engineering department since being graduated from the University of Wisconsin.

### Smith Succeeds Selby

L. A. Smith has been appointed superintendent of the LaFrance-Republic Corp., Alma, Mich., succeeding C. E. Selby, resigned. Mr. Smith has been connected with the company for the past 14 years.

### Stout on Committee

William B. Stout has accepted chairmanship of the committee of awards that will choose winners from competing colleges for the W. E. Boeing scholarship offered at Boeing School of Aeronautics, Oakland, Cal.

### W. L. Mitchell Sails

NEW YORK, April 14—W. Ledyard Mitchell, chairman of the board of Chrysler Export Corp., sailed today to Europe aboard the S. S. Aquitania.

## Defends Trucks Against Laws

### Fifty Bills Threaten Motor Transportation at Illinois Hearing

CHICAGO, April 14—A vigorous defense of motor transportation was set forth yesterday at the opening of hearings before Representative G. J. Johnson, when testimony from trucking interests on 50 bills pending before the Illinois General Assembly was taken.

Statistics were introduced to show that trucks and buses paid \$22,296,736 in taxes to Illinois last year while private automobiles paid \$24,184,566, less than two million more, and that commercial vehicles used the highways one-fourth as many miles as private cars in the face of a ratio of seven private cars to one commercial vehicle.

A. G. Perry, Detroit-Chicago motor transport man, protested that trucks performed a service railroads were unable to offer and performed a public service which should not be curtailed by excessive taxation.

### Pines Has New Product

CHICAGO, April 14—Pines Winterfront Co. yesterday announced that it will shortly offer the automobile trade a new product, a portable device embodying an electric flashlight designed for servicing storage batteries with distilled water. C. A. Pipenhagen, chairman of the board, anticipates that the new product will make a substantial addition to 1931 sales.

### Wise at Capacity

DETROIT, April 14—Wise Chrome Products Co., Detroit, is operating on capacity schedule of 24 hours a day, seven days a week, according to D. W. Bauer, vice-president. Contracts received from parts and accessory manufacturers will maintain this schedule beyond the middle of the year, Mr. Bauer states.

### Morse Business Gains

CHICAGO, April 14—Business volume of the Morse Chain Co., subsidiary of Borg-Warner Corp., for the first quarter of this year was 20 per cent greater than the last three months in 1930, it was announced today by C. S. Davis, president of the parent corporation.

### U. S. Buys 1000 Essex Cars

DETROIT, April 14—A government contract has been awarded the Hudson Motor Car Co. for 1000 Essex Super Six units to be used by the postal departments on mail delivery work in 25 cities, for light and heavy duty and long and short hauls.

## Ford Extension of Junking Seen

### Completion of 400-Ton Open-Hearth Furnace Viewed as Significant

DETROIT, April 15—Officials of the Ford Motor Co. would neither affirm nor deny a report appearing in the *Wall Street Journal* this week that the company would shortly extend its junking operations to the disassembly of 5000 units daily, with the recently completed installation of a 400-ton open-hearth furnace.

The newspaper estimated, in its article, that materials obtained from breaking up obsoleted vehicles netted the Ford Motor Co. an average of \$11 per car, from which must be subtracted the cost of hauling the cars to the Dearborn plant (this was estimated at \$2—\$5 per car) and the cost of operating the disassembly line.

The article stated that the Ford Motor Co. was planning to extend the junking operations to cars collected in other places than the Detroit zone area, and that arrangements would probably be made to have Ford-owned ships carry to Dearborn return cargoes of obsoleted vehicles turned in to assembly plants at strategic points all over the United States.

### Austrian Taxes Lowered

WASHINGTON, April 14—Annual taxes on the cylinder capacity of automobiles operating in Austria have been substantially reduced, and the chief revenue will hereafter be derived from a gasoline tax equivalent to 5 cents a gallon, according to the Automotive Division, Bureau of Foreign and Domestic Commerce. The new law, effective May 1, removes one of the chief restrictions to the sale of American automobiles in Austria, it is believed. Trucks, taxicabs and buses are entirely exempted from the power tax, paying only that upon gasoline.

### Road Builders to Meet

WASHINGTON, April 14—The annual meeting of the American Road Builders' Association will be held in Washington, May 15. Meetings of the old and new boards of directors, and of the various divisions will be held May 14 and 16. Stanley Abel, Taft, Calif., has been named a vice-president of the association to fill the vacancy caused by the death of the Hon. Samuel Hill, Seattle, Wash.

### Sets New Record

DETROIT, April 13—Flying a cabin type Lockheed Vega monoplane owned by Powel Crosley, Jr., of Cincinnati, Ruth Nichols established a new women's speed record here today, subject to confirmation by the F.I.A. Her average speed for the four laps re-

quired was 210.65 m.p.h. as against the former record held by Amelia Earhart of 181.1.

According to R. A. Leavell, official timer, Miss Nichols' fastest lap over the straightaway course, with the wind, was 226.880 m.p.h. The ship was powered with a supercharged Pratt & Whitney Wasp, developing approximately 500 hp.

### Cadillac Adds Colors

DETROIT, April 13—Five additional color combinations for the LaSalle are included among the new standard production colors which the Cadillac Motor Car Co. has chosen for its cars in May.

The LaSalle has previously been offered in six combinations. All of these have been discarded and 11 new ones selected. Ten new combinations have also been adopted for the Cadillac V-Eight, and the same number for the Cadillac V-12. The Cadillac V-16, as usual, is available in any color scheme.

### Waukesha Celebrates

WAUKESHA, WIS., April 13—The Waukesha Motor Co. has just celebrated its silver jubilee, having been founded in a small way on April 6, 1906, by Harry L. Horning, shortly after his graduation from Carroll College, Waukesha. Mr. Horning has been president and chief engineer of the company throughout its existence. He is a former president of the S. A. E. The plant today covers 500,000 sq. ft. and builds 40 models of gasoline and Diesel engines.

### Welders Plan Meeting

NEW YORK, April 14—The annual meeting of the American Welding Society to be held in New York, April 22-24, includes papers to be read on "Some Resistance Welding Problems," by C. L. Pfeiffer, Western Electric Co., and "High Tensile Atomic Hydrogen Arc Welds in Alloy Steels," by Frederick Ray, Croll Reynolds Engineering Co.

### Graham Exports Rise

DETROIT, April 13—Graham-Paige Motors Corp. has reported a consistent gain in export shipments during the first quarter, with March showing a 29 per cent increase over February, which had gained 28 per cent over January.

### Bear Business Gains

ROCK ISLAND, ILL., April 13—The Bear Mfg. Co. has announced that its business for the first quarter of this year was 40 per cent ahead of that for the first quarter of last year.

## General Motors Sales Gain

### Those to Consumers in March Are 47 Per Cent Above February Level

NEW YORK, April 16—In March General Motors dealers sold 101,339 cars to consumers in the United States, or an increase of 47 per cent over deliveries to consumers in the United States in February. In March, 1930, General Motors dealers sold to consumers in the United States 123,781 cars, or an increase of 39 per cent over February, 1930.

Sales by General Motors to dealers in the United States in March amounted to 98,943 cars, as compared with 118,081 in March, 1930.

Total sales to dealers in March, including Canadian sales and overseas shipments, amounted to 119,195 cars, as compared with 135,930 in March, 1930.

	United States Sales to Consumers	United States Sales to Dealers
1931	1930	1931
Jan. ....	61,566	74,167
Feb. ....	68,976	88,742
Mar. ....	101,339	123,781
Total Sales to Dealers, including Canadian Sales and Overseas Shipments		
	1931	1930
Jan. ....	89,349	106,509
Feb. ....	96,003	126,196
Mar. ....	119,195	135,930

Unit sales of Chevrolet, Pontiac, Oldsmobile, Marquette, Oakland, Viking, Buick, LaSalle and Cadillac passenger and commercial cars are included in the above figures.

### To Continue Lines

SOUTH BEND, April 13—The Studebaker Corp. has announced that no new models of its free wheeling lines of cars will be announced until next winter. This is in conformity with the recommendation of a special committee of the National Automobile Chamber of Commerce, and follows similar announcements made some time previously by Buick and Marmon.

### Ford Has New Town Sedan

DETROIT, April 13—The new town sedan body type on the Model A chassis has just been announced by the Ford Motor Co. The car has a sloping windshield and the body is approximately 3 in. longer than the town sedan it replaces. A picture of the new type was published in *Automotive Industries* March 7.

### Hudson Adds 523 Dealers

DETROIT, April 13—The Hudson Motor Car Co. added 523 new Hudson and Essex dealers during the first quarter of this year, according to William J. McAneny, president and general manager.

## Plane Makers Stand Pat on Price

### Curtiss-Wright Officials Hint at Further Cuts if Met on Figures

DETROIT, April 16—A halt seems to have been called temporarily in the price war between Curtiss-Wright Corp. and Stinson Aircraft Corp. The prices on the four-place cabin models affected now stand at \$4,595 for the Challenger-powered Curtiss-Wright Sedan. The Stinson Junior with Wasp engine now lists at \$8,995 and the Kinner-engined Curtiss model at \$5,100. The new prices on the Lycoming-powered Stinson Junior and the Curtiss Challenger-powered Sedan represent reductions of \$1,000 and \$3,400 respectively. Walter Beech, president, Curtiss-Wright states that he will further reduce prices if his present prices are met or bettered. Other models produced by both companies are not affected.

### Met Section Meets

NEW YORK, April 16—Brakes and their relation to highway safety was the subject of this evening's meeting of the Society of Automotive Engineers, Metropolitan Section. David Beecroft, past president of the S.A.E., and now affiliated with Bendix Aviation Corp., was the speaker. The May meeting is scheduled to discuss Diesel engines under the leadership of F. VanRossem Hoogendyk of Munich, Germany. There will also be some Diesel trucks and busses on exhibition at the time of the May meeting.

### Diamond T Shifts Advertising

CHICAGO, April 16—The Diamond T Motor Car Co. has abolished the position of advertising manager, held by David Ainsworth, and copy will henceforth be placed by the Roche Advertising Agency. G. E. Roller will be the contact man at the factory.

### Sterling Adds Workers

KNOXVILLE, TENN., April 16—Sterling Wood Products Co., manufacturing automobile wood body parts, is now employing a larger force than any time since November, 1930.

### Accountants to Meet

NEW YORK, April 15—The National Association of Cost Accountants will hold its twelfth international cost conference in Pittsburgh June 15 to 18 at the William Penn Hotel.

### Dissinger Adds Line

WRIGHTSVILLE, PA., April 15—C. H. A. Dissinger Bro. and Co., manufacturer of engines, tractors and industrial equipment, has announced the

addition of a new line of two-cylinder heavy oil engines. A number of improvements have also been effected in the gasoline engine line, according to C. H. A. Dissinger, treasurer of the company.

### Sees Tool Sales Gain

MILWAUKEE, April 13—Albert E. Grover, cost consultant, National Machine Tool Builders' Association, who spoke before the monthly meeting of the Milwaukee Chapter, National Association of Cost Accountants, said that the machine tool business is experiencing a distinct upward trend once more, although it probably will not be until fall that the most encouraging signs will appear.

### Clark Has New Engine

NEW YORK, April 13—Clark Bros. Co., Olean, N. Y., has developed an eight-cylinder four-cycle vertical stationary engine. This new engine uses either natural gas or gasoline as a fuel, is of the inclosed type and has automatic lubrication.

### Mitchell at 60 Per Cent

PHILADELPHIA, April 13—Mitchell Specialty Co. has announced that its employment schedules are running at 60 per cent of the 1929-30 peak average, and 140 per cent above the low point reached about Jan. 1. New employees continue to be added.

### Monroe and Norberg Sail

NEW YORK, April 15—R. C. Norberg, president, and K. W. Monroe, export manager of the Willard Storage Battery Co., sailed today aboard the S. S. Leviathan for a trip to Europe.

### Passes Insurance Bill

BALTIMORE, April 13—The Maryland General Assembly has passed a bill which provides for compulsory motor vehicle insurance in certain cases. The measure is now before Gov. Albert C. Ritchie for his action.

## Ford Profit Set for 1930

Indicated as \$44,460,823 in Report to State of Massachusetts Authority

BOSTON, April 13—The 1930 profits of the Ford Motor Co. are indicated as amounting to \$44,460,823, equal to \$257 a share on the 172,645 shares of capital stock, all of which are held by Henry and Edsel Ford, and Mrs. Henry Ford. These earnings figures do not take into consideration any dividends which may have been withdrawn during the year by the principals.

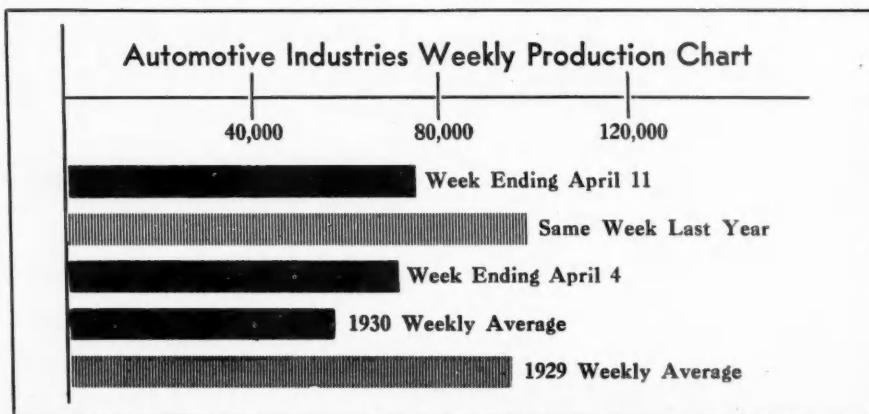
The statements above are based on the balance sheet of the Ford Motor Co., which was filed last week with the Massachusetts Commissioner of Corporations, and which furnishes the only public record of the financial operations of the Ford Motor Co.

The surplus of the company as of Dec. 31, 1930, was \$708,888,247, against \$664,427,424 at the end of 1929. The indicated profit for 1930 of \$44,460,823 compares with an indicated profit of \$81,797,861 in 1929 and an indicated loss of \$72,221,498 in 1928.

The balance sheets show total assets of \$781,964,571 at the end of 1930, compared with \$761,077,996 at the close of the previous year. The assets include real estate valued at \$152,636,931; machinery and equipment at \$112,482,374; and cash, notes, accounts receivable, securities, patent rights, etc., carried at \$382,898,719.

### Marmon 16 Comes Off Line

INDIANAPOLIS, April 16—The emergence of the first Marmon 16-cylinder car from the regular production line of the Marmon Motor Car Co. today, was the subject of ceremony attended by officials of the company, headed by G. M. Williams, president. Several models of the new 16 had been built previously, some of which have been sold on the market, but the car today was the first to come along through regular production channels.



# Foreign Automobile Stocks as of March 31, Reported by Cable

(Automotive Division, Bureau of Foreign and Domestic Commerce)

Country	PASSENGER CARS				USED CARS				TRUCKS AND BUSES			
	Low Priced U.S.	Priced Other	Medium Priced U.S.	Priced Other	High Priced U.S.	Priced Other	U.S.	Other	Heavy U.S.	Capacity Other	Light Capacity U.S.	Capacity Other
Cuba	N	...	N	...	H	...	H	...	H	...	N	...
Mexico	N	...	NN	...	N	...	SH	...	N	...	NN	...
Columbia	N	None	N	L	N	None	H	UL	H	L	NN	None
Panama	N	...	L	...	N	...	N	...	N	...	N	...
Venezuela	All stocks normal.											
Chile	N	...	N	...	UH	N	UH	N	H	N	H	N
Peru	All stocks normal.											
Argentina	N	H	N	H	SH	SH	N	N	H	UH	H	N
Brazil	N	N	LL	HN	N	L	L	L	H	H	NN	NN
Uruguay	N	N	LL	LN	L	L	L	UL	N	N	NN	NN
Denmark	N	NN	LN	N	H	None	UH	UH	N	...	NN	...
Finland	N	N	LN	...	...	...	UH	...	N	...	NN	...
Sweden	SH	...	HH	SH	SH	SH	N	UH	SH	...	HN	...
Norway	N	N	SH	SH	N	L	H	L	L	L	NN	LL
Belgium	N	SH	LN	N	N	N	L	N	L	L	NN	LN
Netherlands	SH	SH	N	SH	SH	SH	N	N	SH	SH	NN	NN
France	N	UH	L	SH	LL	SH	H	UH	None	N	SH	SH
Germany	SL	N	UL	H	H	H	H	H	None	H	NN	NN
Spain	N	L	NN	L	UL	L	L	L	None	N	NN	NN
Austria	N	N*	NN	UH	NN	H	H	H	None	H	NN	NN
Czechoslovakia	H	H	HH	UH	NN	H	H	H	None	H	NN	NN
Hungary	N	SH	HH	SH	NN	N	UH	UH	N	SH	NN	NN
Greece	L**	H	NN	H	N	H	H	H	N	SH	NN	NN
Italy	H	H	H	N	N	L	H	H	None	N	NN	NN
Portugal	H	H	LL	N	LL	L	H	H	None	L	NN	NN
Poland	N	SH	HL	N	UL	L	N	H	None	L	NN	NN
Rumania	H	N	LL	N	UL	L	N	H	LL	UL	NN	NN
Egypt	N	N	NN	N	N	L	UL	N	...	N	L	N
Gold Coast	L	N	SL	...	None	None	N	...	None	None	None	None
China	...	Stocks considered high due to exchange situation.										
Japan	UL	N	N	N	L	...	N	L	N	...	L	...
N. E. Indies	H	...	NN	SH	L	...	H	...	H	...	H	...
British Malaya	H	N	NN	N	...	...	H	...	UH	N	NN	...
Siam	H	H	N	N	N	...	H	H	...	...	UH	NN
India	SH	N	SH	N	H	SH	NN	N	N	...	HH	NN
Australia	H	N	H	N	UH	N	NN	L	H	N	HH	LN
New Zealand	UH	H	UH	N	H	N	H	H	H	N	...	...

\* (Steyr stocks high)

\*\* (Except two well-known American makes which are normal.)

H-High, N-Normal, L-Low, U-Unusually, S-Seasonally.

All descriptive terms used in this report pertain to the stock situation in relation to the current condition of each market. "High" stocks means the supply is considered large in relation to the current state of demand although the same vol-

ume might be regarded as "normal" at a time when sales were more active. "Normal" is used almost synonymously with "adequate"—in other words when the volume on hand is sufficient to supply immediate requirements plus the esti-

mated demand for 1-1½ months. It is believed this method of reporting is more suitable than to describe the volume of stocks in comparison with some arbitrarily determined period which might be regarded locally as normal.

## New Warranty Ready

NEW YORK, April 16—A new standard warranty for commercial vehicles, approved as to form March 12 by the Truck Committee of the National Automobile Chamber of Commerce, has been printed and is ready for distribution to truck manufacturers. The new warranty replaces the joint (passenger car and commercial vehicle) warranty approved as to form Dec. 3, 1913, insofar as commercial vehicles are concerned. There is no change in the new warranty except that the 90-day term for which it applies is applicable only on condition that the commercial vehicle shall not have been operated in excess of 5000 miles.

## Warns Against Cycle

(Continued from page 633)

Commenting on a paper by W. Lawrence LePage, Kellett Aircraft Corp., on the Autogiro, Ralph Upson, professor of aeronautics, University of Michigan, said that there was a common misconception regarding the potentialities of this craft. He said that the major field for the Autogiro was for higher speed work due to its ability to land slower. He did not feel that the ability to land vertically or nearly so should limit the Autogiro to low top-speed ships. Mr. LePage agreed with him, suggesting a ship with approximately 30-m.p.h. landing speed as a desideratum.

## Financial Notes

Allis-Chalmers Mfg. Co. has declared quarterly dividend of 50 cents payable April 15 to stockholders of record April 24, placing its stock on a \$2 annual basis as compared with the former \$3 basis.

Checker Cab Mfg. Co. reports net profit for 1930 of \$504,690. This compares with net income of \$4,280,416, or \$11.41 a share, in 1929.

Durant Motors Co. of Canada, Ltd., reports net loss for 1930 of \$150,344 after all charges, compared with net profit in 1929 of \$366,129.

Johns-Manville Corp. and subsidiaries report net profit for the first quarter of the current year of \$230,109. This is equivalent after preferred dividends to 13 cents a share on common stock and compares with earnings of \$741,630, or 81 cents a share, in the first quarter of last year.

Kent Garage Investing Corp. reports profit for the year 1930 of \$232,484. This compares with profit of \$66,939 for 1929.

Russell Motor Car, Ltd., has declared regular quarterly dividend of \$1.25 on common and \$1.75 on preferred stock, both payable May 1 to holders of record April 17.

## Chevrolet Sales Increase

DETROIT, April 16—Domestic sales of Chevrolet cars during March were 73,628 units, a 48 per cent gain over sales in February. Stocks of new cars in the hands of dealers were reduced by 6500 units and stocks of used cars dropped more than 5000 units during the month, the Chevrolet Motor Co. reports.

## Allis and Rumely Merge

CHICAGO, April 15—The plant and sales offices of Advance-Rumely Corporation, La Porte, Ind., has been acquired by Allis-Chalmers Manufacturing Company, according to an announcement by Max W. Babb, vice-president of Allis-Chalmers yesterday. Neither a description of the properties and assets to be acquired nor the purchase price were disclosed. Consumption of the deal requires only the investigation of auditors, Babb stated.

The lines of Allis-Chalmers and Advance-Rumely do not overlap, but supplement each other.

## Asks Gardner Receiver

ST. LOUIS, April 15—Suit for a receiver was filed against the Gardner Motor Co. and its directors in Circuit Court today by Oliver T. Remmers, lawyer and chairman of the election board, who has owned 80 shares of the company's stock since it was organized. Remmers declared in the petition that the company suffered a net loss of \$861,000 last year and \$430,000 in 1929. He asked that the company be enjoined from diverting the business to channels other than the manufacture of automobiles, which was abandoned several months ago, and that an accounting of assets be required. Judge Hartmann issued an order to show cause why a temporary receiver should not be appointed.

## Tire Stocks Show Rise

### Average Number of Casings Held by Dealers as of April 1, Increases in Year

WASHINGTON, April 16—On April 1, 1931, the average stock of automobile and truck casings per tire dealer was 94.0, according to preliminary statistics reported by 27,132 dealers, to the Rubber Division, Bureau of Foreign and Domestic Commerce. This is 11.0 tires per dealer greater than the final average on April 1, 1930; and 0.4 less than on April 1, 1929. The final average on April 1, 1929, was 4.1 tires per dealer greater than the preliminary average, and in April 1, 1930, 7.9 tires per dealer higher than the preliminary average.

Dealers reporting stocks of high pressure casings were tabulated separately: 19,415 dealers reported 332,332 high pressure casings in stock, or 17.1 per dealer—24,309 dealers reported 544,923 high pressure casings (22.4 per dealer) on April 1, 1930. High pressure casings accounted for 21.37 per cent of the total in April, 1930, and 13.04 per cent in April, 1931. Inner tubes held by dealers average 115.9 as compared with the figure of 118.6 for April 1, 1930.

A comparison between the preliminary statistics for April 1, 1931, and the final statistics for April 1, 1930, is made in the following table:

Dealers' Stocks of Tires			
April 1, 1930			
	Dealers Number	Re-reporting	Average Dealer
Total casings...	2,550,222	30,717	83.0
High pressure...	544,923	24,309	22.4
Inner tubes ...	3,637,543	30,677	118.6
Solids .....	40,829	1,436	28.4

April 1, 1931			
	Dealers Number	Re-reporting	Average Dealer
Total casings...	2,549,696	27,132	94.0
High pressure...	332,332	19,415	17.1
Inner tubes ...	3,160,006	27,268	115.9
Solids .....	24,517	1,153	21.3

### Detroit Electric Moving

DETROIT, April 15—Detroit Electric Car Co. will move next month to a larger plant on Lafayette Street. A. O. Dunk, president, reports sufficient orders on hand to carry operations well into July. The company is introducing a new line of passenger cars closely resembling gasoline automobiles. All models will list at around \$4,000.

### Chevrolet Plant Progressing

INDIANAPOLIS, IND., April 18—Announcement has been made today that production of the new Chevrolet commercial body plant has totaled more than 22,000 bodies since Oct. 15. On that date the plant was taken over from the Martin-Parry Co. by

Chevrolet. Sixteen different types are now in volume production, and plans are complete for building three additional types.

Since acquiring the plant, Chevrolet has renovated the buildings and grounds, replaced obsolete equipment, and opened and placed in operation 52 body assembly plants at as many zone points. These zone assembly plants, all now in operation, add nearly a half-million square feet of space to the expansion.

Factory employment is currently running around 650 men, according to J. A. Jamieson, general manager. The zone assembly plants employ several hundred additional men.

### Refiners are Cleared

CHICAGO, April 14—Fifty of the foremost oil companies in the United States, defendants in the government's famous gasoline cracking patents suit, yesterday were absolved of all guilt on charges of violation of the antitrust laws. The decision was handed down by the Supreme Court on the action filed in Chicago seven years ago. Standard Oil Co. of Indiana, Standard of New Jersey, Texas Corp., Gasoline Products Co. and a large group of secondary defendants are thus cleared.

### Fairchild Changes Name

FARMINGDALE, L. I., April 13—With the establishment of the Fairchild Aviation Corp. as an independent corporation, the manufacturing divisions of this company have been incorporated as the American Airplane and Engine Corp. The new corporation is the manufacturing division of the Aviation Corp.

The change also means the dropping of the name "Fairchild" for the products of the Aviation Corp. Airplanes built by the company will, in future, bear the trade name "Pilgrim," while engines will carry the trade name of "Ranger." Servicing of former Fairchild products will be undertaken by the American Airplane and Engine Corp. which will also continue to operate the Farmingdale factories.

### Young Reports Profit

DETROIT, April 15—L. A. Young Spring and Wire Co. reports for quarter ended March 31, net income of \$233,080 after depreciation and federal taxes equaling 56 cents a share on 412,500 no par value shares, of which 24,302 are held in the company's treasury, comparing with \$516,885 or \$1.25 a share in the first quarter of 1930.

### Federal Sales Increase

DETROIT, April 13—Federal Motor Truck Co. has reported that sales of Federal trucks for the month of March showed a 50 per cent increase over the February sales total. More orders were received during March than any other month, with but one exception, in the last eight months.

## Milwaukee Wins Right to Tax

### Automobile Manufacturer Loses an Attempt to Prove Right to Exemption

MILWAUKEE, April 13—Buick Motor Co. has thus far failed in its attempt to enjoin the City of Milwaukee from collecting \$226,734 in taxes under the Wisconsin income tax law, litigation which has been watched with great interest throughout the United States. The decision of Judge Geiger in the federal court here, that subsidiaries doing business in the state must pay an income tax, although nominally owned and controlled by a holding corporation, has just been affirmed by the United States Circuit Court of Appeals.

In opposing the income tax assessment, Buick contended that it has a contract with General Motors Co. whereby the holding company paid \$2,500 a year to the Buick company for selling cars in Wisconsin as a subsidiary of General Motors. Judge Geiger held that Buick could not "contract away its income in advance" and that "the contract cannot be interposed as a means of cutting off the income from the business." Counsel for the city of Milwaukee pointed out that if subsidiaries of foreign corporations had been freed of taxation through such a relation, the burden of taxation would have fallen back on Wisconsin corporations, and it would also have resulted in the incorporation of Wisconsin concerns outside of the state.

### Rubber Consumption Gains

NEW YORK, April 13—Crude rubber consumption in the United States during March is estimated by the Rubber Manufacturers Association at 32,788 long tons, an increase of 13.9 per cent over February consumption. Imports during the month totaled 40,338 long tons as compared with 36,645 in February and with 45,430 in March a year ago.

Domestic stocks on hand and in transit overland as of March 31 are estimated at 217,804 long tons, an increase of 2.3 per cent over February and 53.6 per cent over March last year. Crude rubber afloat for the United States on March 31 is estimated at 63,133 long tons as against 63,680 on Feb. 28 and 63,646 on March 31, 1930.

### Graham Sees Improvement

CHICAGO, April 14—"The automobile industry is definitely on the upgrade," George M. Graham, vice-president, Willys-Overland Co., said yesterday while here in connection with the special spring showing being put on by Chicago dealers.

### Wood Adds Workers

DETROIT, April 15—Gar Wood, Inc., has added more than 100 men to the force at the Marysville plant to fill orders which accumulated during March.

## Reeves Sees Longer Season

### Believes Summer Slackening of Sales Will Be Modified

DETROIT, April 14—Pressure for "business volume at any price" has largely disappeared in the automobile industry and with production advancing steadily, in response to an encouraging expression of buying interest, the automotive leaders are looking forward to a sales season extending far beyond the usual period. The usual spring selling continues to increase with good weather.

This interpretation of the motor industry's position was expressed by Alfred Reeves, general manager of the National Automobile Chamber of Commerce, upon his arrival in Detroit for the National Air Show and to hold conferences at the various automobile factories.

"There should not be any appreciable decrease in the automobile business this summer such as has usually followed the spring buying season," said Mr. Reeves.

"The seasonal influence upon car buying has been substantially reduced through readjustment in the industry's merchandising policies. A large part of this is due to the manufacturers' decision not to announce new models during the summer."

## Engine Rebuilders to Meet

NEW YORK, April 15—The ninth annual convention of the Automotive Engine Rebuilders Association will be held in Chicago, May 18-21. Headquarters of the convention will be at the Sherman Hotel, at which meetings and exhibits will be held. R. G. Patterson, Indianapolis, is president of the association, and R. C. McWane, New York, is secretary. L. C. Smith, Chicago, heads the local committee making arrangements for the convention.

## Automotive Imports Rise

WASHINGTON, April 15—February imports of automotive products amounted to \$52,614 as compared with \$39,163 in January, according to the Automotive Division, Bureau of Foreign and Domestic Commerce. The actual number of units was lower, being 36 in February and 40 during the previous month, but the current month's total carried a valuation of \$36,806 as against \$15,474 for January. Bodies and parts were only slightly higher in February.

## George W. McNear

BOSTON, April 13—George W. McNear, one of the pioneer custom body

builders, died suddenly last night at his home here.

Mr. McNear came here at an early age from Bethany, Mo., where he was born. He started to learn the carriage business with one of the Boston companies around 1900. Then he went into business for himself and built up a fine clientele. He had a plant at Brookline, Mass.

## Boeing Gets Army Order

WASHINGTON, April 13—A contract for 135 new type Boeing military Wasp-powered pursuit planes totaling \$1,541,366 has been received by the Boeing Airplane Co. from the Army Air Corps.

Officials of the company say that the new type pursuit, which is to be designated as the Boeing P-12E, will be the fastest full military standard pursuit plane in the United States. Powered with a Wasp engine, the new pursuit plane will differ from the present Boeing pursuit in that the body will be of all-metal construction and will incorporate a number of other improvements.

## Samuel Woolner, Jr.

NEW YORK, April 14—Samuel Woolner, Jr., who retired two months ago from the presidency of Kelly-Springfield Tire Co., died at his home here yesterday. Mr. Woolner was also president of the Rubber Manufacturers Association until shortly before his death. In addition to his business career in the rubber field, Mr. Woolner was active in Democratic circles in his home state of Illinois. Surviving are his widow, Mrs. Martha Moses Woolner, a daughter, Mrs. Stephen Jacoby, and a son, Adolph.

## Auburn Passes 1930 Mark

AUBURN, IND., April 13—R. H. Faulkner, president of the Auburn Automobile Co., announced today that with the shipment of 2170 Auburn and Cord cars by the company in the first 11 days of April, Auburn's total shipments since Jan. 1 of this year had passed the 1930 entire total by 195 cars. Auburn and Cord front drive shipments since Jan. 1, 1931, ending April 11, totaled 13,888 as against 13,693 for the full year of 1930.

## F.A.I. to Meet

WASHINGTON, April 14—The International Aeronautic Federation (Federation Aeronautique Internationale), under the chairmanship of Prince Valentin Bibesco, will meet in Bucharest, Roumania, June 6 to 14.

The Royal Roumanian Aviation Club has organized an international air rally to take place on June 6. The rally is open to all types of aeroplanes, whether civil or military, of all countries which are members of the Federation. Prizes will be awarded.

## Nash Declares At Usual Rate

### C. H. Bliss Elected a Vice-President of the Company

KENOSHA, WIS., April 13—At a directors' meeting of The Nash Motors Co. held at the office in Kenosha, a dividend of \$1.00 per share was declared payable on May 1 to stockholders of record at the close of business April 20.

The balance sheet and earnings statement for the first quarter, which includes December, 1930, January and February, 1931, was presented, showing cash and Government securities in the company's treasury amounting to \$35,747,486. The company earned during the quarter \$1,099,193.53, after deducting all expenses of manufacturing, selling and administration, and providing for depreciation and both state and federal taxes.

At the meeting, C. H. Bliss, who has long been identified with the company as sales manager, was elected a vice-president and director of sales.

It was pointed out at the meeting that stocks of cars in the hands of Nash dealers throughout the United States were never as low at this season of the year as at the present time. Registrations and orders on hand indicate immediate future improvement in demand.

## Meeting Postponed

TORONTO, April 14—A special meeting of shareholders of Durant Motors of Canada, Ltd., to consider the transfer of assets of the company to Dominion Motors, Ltd., in which Charles W. Nash will have an interest, has been postponed until May 7. This action follows the interim injunction obtained last week by Durant Motors of Michigan to prevent transfer of the assets.

## Durant Sales Improve

NEW YORK, April 14—Sales of Durant cars during 1931 have shown steady improvement, according to a bulletin to dealers issued by H. W. Alger, general manager. February sales show an increase of 46.8 per cent over January, March an increase of 80.4 per cent, and Mr. Alger believes that April will show an increase of 100 per cent.

## Sky Corp. Reports Assets

DETROIT, April 13—Balance sheet of Sky Specialties Corp. as of Dec. 31, 1930, shows total current assets of \$396,046, including \$310,655 in cash. Current liabilities amounted to \$359. The company carries patents and engineering records at \$411,596.

## Auburn Earns \$1.06 Per Share

### First Fiscal Quarter Profits Are Better Than Last Year

CHICAGO, April 13—Auburn Automobile Co. and its subsidiaries for the months of December, January and February, comprising the first quarter of the current fiscal year, ended Feb. 28, 1931, earned consolidated net profits of \$202,409, equal to \$1.06 per share on the 191,292 shares outstanding at that date. This compares with the net profits of \$96,623 for the corresponding period in 1930 or 51c per share on the same number of shares.

The consolidated balance sheet of the company and its subsidiaries as of Feb. 28, 1931, reflects current assets amounting to \$13,021,752, and current liabilities of \$3,831,269.

In releasing the statement, E. L. Cord, chairman of the board of the company, said:

"The results obtained for this period were made possible by a highly developed program of stringent economies, and by offering the public, at the first of the year, what now appears to be conceded one of the greatest values ever offered in the automobile industry.

"The widespread acceptance on the parts of distributors, dealers and the public has been enormous, and in most instances our principal distributors have delivered, in the first three months, more cars than in the entire year of 1930.

"The future is viewed with considerable optimism by the management. The comparative profit and loss statement follows:

	1930	1931
Sales—net .....	\$6,438,740.79	\$7,365,320.65
Cost of sales, excluding depreciation .....	5,303,836.39	6,251,771.94
Gross profit ....	\$1,134,904.40	\$1,113,548.71
Administrative and selling expense .....	940,778.01	739,364.22
Operating profit before depreciation .....	\$194,126.39	\$374,184.49
Other income ...	35,014.03	80,458.54
	\$229,140.42	\$454,643.03
Depreciation ...	160,122.59	138,197.12
	\$69,017.83	\$316,445.91
Other expense ..	77,213.06	39,183.77
Net profit before Federal Income Tax .....	\$8,195.23	\$277,262.14
Federal Income Tax .....	41,617.52	14,389.13
	\$49,812.75	\$262,873.01
Proportion of net profit or loss of subsidiary companies applicable to minority interest in common stock .....	146,436.63	60,463.23
Consolidated net profit.	\$96,623.88	\$202,409.78
February 28, 1931 —191,292 shares outstanding—per share ....	\$0.51	\$1.06

### Chance Vought Elects

NEW YORK, April 13—Chance Vought Corp. has elected C. J. McCarthy as vice-president and Paul Becker sales and personnel manager.

The company has developed a new plane for executive travel, known as

the Model V-50 Corsair. This ship has a top speed of over 190 miles an hour and a cruising speed of 165 miles an hour. It is powered with a Pratt & Whitney 600-hp. supercharged Hornet engine, and is essentially similar to the Vought Corsairs in use in military service in this and other countries. It is a two-place open cockpit plane, although it can be converted readily into a cabin plane.

### Morris Profits Increase

LONDON, March 30 (by mail)—The net profit on trading and interest for the year ended Dec. 31, 1930, of Morris Motors, Ltd., as shown in the report and accounts just issued, amounted to £1,303,308, after making full provision for depreciation of assets and all contingencies. This compares with £1,285,181 for 1929. The directors consider that the results of the year are very satisfactory, inasmuch as the trading conditions both at home and overseas have been extremely difficult owing to the depressed state of industry.

After meeting the dividends on the preference shares and paying income tax, there is a balance of £820,994, to which must be added the balance brought forward from last year of £118,753, and the profit realized on investments sold of £9,408, thus giving a total profit available for distribution of £949,155.

### Wisconsin Sales Pick Up

MILWAUKEE, April 13—Sales of new passenger cars in the State of Wisconsin in March numbered 5494, compared with 3360 in February, and 8919 in March, 1930. Total registrations, Jan. 1 to April 1, were 11,754, compared with 17,761 in the first quarter of 1930. Commercial car registrations in March were 949, against 1328 in the same month last year. Total sales in the first quarter were 2049, compared with 2969 a year ago.

### Amtorg Purchases Valued

NEW YORK, April 13—Purchases of automotive equipment by the Amtorg Trading Corp., official agent in America of the Union of Socialist Soviet Republics, during the year 1930 reached the sum of \$7,087,000, according to an announcement by the corporation. Agricultural equipment purchased in the same period was valued at \$7,907,000 according to the announcement.

### To Entertain Delegates

MADISON, WIS., April 13—Members of the Oil and Gas Power Division, American Society of Mechanical Engineers, will be special guests at the dedication of the new Mechanical Engineering building at the University of Wisconsin here when the formal dedicatory ceremonies take place on Monday, June 22, Commencement Day.

## Business in Brief

Written by the Guaranty Trust Co., New York, exclusively for Automotive Industries

NEW YORK, April 15—There has been some falling off in retail trade since the increase for the Easter holidays, although the recent warmer weather has stimulated the sales of clothing. On the whole, retail trade throughout the country last week was fair, while jobbing trade was on a moderate scale. Industry continued to lag, with the cotton textile industry less active.

### DEPARTMENT STORE SALES

Total value of department store sales during March, according to the Federal Reserve Board, were approximately 3 per cent below those a year ago. Sales during March increased by about the estimated seasonal amount.

### CHAIN STORE SALES

Sales of 32 store chain companies, including three mail order houses, during the first quarter of this year were 4.90 per cent below those a year ago. Sales of the three mail order houses alone decreased 12.17 per cent.

### BUSINESS FAILURES

Commercial failures during March, according to R. G. Dun & Co., numbered 2604, as against 2563 during the preceding month and 2347 a year ago. The liabilities involved in the March failures amounted to \$60,386,550, as against \$59,607,612 in February and \$56,846,015 a year ago.

### CRUDE OIL OUTPUT

Average daily crude oil production for the week ended April 4 amounted to 2,252,100 barrels, as against 2,275,350 barrels for the preceding week and 2,530,450 barrels a year ago.

### CAR LOADINGS

Railway freight loadings in the week ended March 28 totaled 740,079 cars, which marks a decrease of 1863 cars below those in the preceding week, a decrease of 145,245 cars below those a year ago, and a decrease of 229,117 cars below those two years ago.

### FISHER'S INDEX

Professor Fisher's index of wholesale commodity prices for the week ended April 11 stood at 75.2, as against 75.3 for the week before and 75.6 for two weeks before.

### BANK DEBITS

Bank debits to individual accounts outside of New York City during the week ended April 8 were 23 per cent below those a year ago.

### STOCK MARKET

The stock market last week continued to display considerable weakness. Further dividend reductions and suspensions and the absence of any definite signs of revival are generally ascribed as the causes of the market's action in the last several weeks. While there were several rallies during the week, the general trend was downward, with the majority of issues showing moderate net losses.

### BROKERS' LOANS

Brokers' loans in New York City during the week ended April 8 decreased \$53,000,000, marking a total decline of \$91,000,000 during the three weeks ended April 8. The total on that date stood at \$1,822,000, as against \$3,994,000,000 a year ago.

### RESERVE STATEMENT

The consolidated statement of the Federal Reserve banks for the week ended April 8 showed a decrease of \$21,000,000 in holdings of discounted bills, while there was an increase of \$4,000,000 in holdings of bills bought in the open market. Holdings of government securities remained practically unchanged. The reserve ratio on April 8 stood at 83.8, as against 83.5 a week earlier and 85.4 a year ago.

# Steel Prices Tend to Cuts

## Competition for Automotive Business Keen Among Continuous Producers

NEW YORK, April 16—Competition among steel mills for automotive business could hardly be keener. In Detroit the price of full finished automobile sheets is reported to have given way another \$2 a ton in some transactions in which the seller was a nearby mill with motor truck delivery to Detroit plants. In blue annealed sheets the competition of continuous mills makes prevailing quotations strictly nominal.

Black sheets are relatively steady, but the market is more nearly 2.25c, Pittsburgh, than the 2.35c level in vogue a few weeks ago in some of the markets. Full-finished body stock may be quoted at 3.10 @ 3.20c, Pittsburgh, with perhaps the bulk of the business at the higher level, but the lower figure seemingly applying more and more to new tonnage lots.

Car lot business in hot-rolled strip steel is placed at 1.55c, Pittsburgh, for the wider and at 1.65c for the narrower strip. Cold-rolled strip is fairly steady at 2.25c, Pittsburgh, and fender stock at 3.40c, Pittsburgh or Cleveland.

The price scale is tipping pretty close to cost for all flat forms of steel, and in some cases perhaps below cost, but anxiety to maintain operations at as high a rate as possible prompts mills to put tonnage above every other consideration for the time being. Reports that specifications from automotive consumers are coming through rather slowly can usually be traced to disappointed competitors for this or that order. Compared with other steel-consuming lines, demand from motor car manufacturers and part makers is decidedly regular with every indication that it will be well maintained during the second half of April and show moderate gains in May.

**Pig Iron**—Automotive foundries are calling for iron at a slightly higher rate than in March, but are covering their requirements month by month rather than by contracting for the quarter. The Michigan as well as the Valley furnace price is \$17.

**Aluminum**—Middle West reports state that foundries are taking on more secondary metal. The market for primary grades is unchanged.

**Copper**—When custom smelters offered metal at 9½ cents, delivered Connecticut Valley, last week, they were quickly taken up. Quite obviously the pendulum has swung too far in the down direction and, aided by favorable statistics and improved export demand, reaction set in, the market being quite firm at 10 cents, delivered Connecticut and 10-1/8 cents, delivered Middle West, at the week's opening.

**Tin**—Under the restrictive measures adopted by the Federated Malay States, a 22 per cent cut in the 1929 output is ordained as production maximum, making the total available for export approximately 54,000 tons per year. Last year the United States alone took 65,000 tons of Straits tin and the other consuming countries 31,000 tons.

## Experience of Finance Companies and Dealers

### PASSENGER CARS

	1925	1926	1927	1928	1929	1930
1 12 or less equal monthly payments .....	\$50	\$65	\$43	\$56	\$60	\$61
2 13 to 18 equal monthly payments .....	78	94	58	75	83	80
3 Balloon note or over 18 monthly payments .....	220	158	**	**	112	100
<b>Increase of Losses Over Standard Terms</b>						
4 13 to 18 equal monthly payments .....	57	44	35	34	38	31
5 Balloon note or over 18 monthly payments .....	341	143	**	**	87	64
<b>Percentage of Repossessions</b>						
6 New cars with down payment of 33.3% .....	1.7	2.1	2.7	2.8	2.8	3.6
7 New cars with down payment of 25% .....	3.8	4.0	5.9	4.1	5.1	4.6
8 New cars with down payment of less than 25% .....	11.0	11.5	**	**	**	**
9 Used cars with down payment of 40% .....	3.0	4.3	5.2	5.3	5.3	6.5
10 Used cars with down payment of 35% or less .....	6.2	8.6	6.9	10.9	9.0	9.8
<b>Increase of Repossessions Over Standard Terms</b>						
11 New cars with down payment of 25% .....	122	92	115	46	82	28
12 New cars with down payment of less than 25% .....	537	451	**	**	**	**
13 Used cars with down payment of 35% or less .....	105	101	31	93	70	51
<b>Average Amount of Note Purchased</b>						
14 New cars, including some commercial .....	\$550	\$595	\$574	\$625	\$595	\$567
15 Used cars, including some commercial .....	280	277	286	307	296	279
<b>Percentage Sold on Instalments</b>						
16 New cars .....	68.2	64.5	58.0	58.1	62.6	62.3
17 Used cars .....	62.8	65.2	63.1	60.8	65.1	64.8
18 All cars .....	65.5	64.8	60.8	59.5	64.0	63.8
<b>Percentage of Trade-Ins, Sales, Etc.</b>						
19 Trade-ins on sales of new cars .....	..	..	72.0	69.4	72.5	75.1
20 Trade-ins on sales of used cars .....	..	..	37.1	39.4	45.5	49.1
21 Total trade-ins in per cent of new cars sold .....	99.0	90.0	116.0	115.5	127.1	155.5
22 Used cars sold in per cent of new cars sold .....	..	..	118.5	117.0	128.6	164.0
23 Used cars junked in per cent of total trade-ins .....	..	..	6.9	8.1	9.2	14.3
<b>24 Skips per 1000 transactions</b>						
<b>Instalment Paper Ratios</b>						
25 Retail paper with more than 12 monthly payments .....	18.3	13.2	12.4	14.5	14.9	16.6
26 Retail paper with less than standard down payment .....	19.4	9.0	5.2	6.1	8.0	11.8
27 New car paper to total paper purchased .....	69.0	67.0	73.2	71.6	70.0	63.4
28 Used car paper to total paper purchased .....	31.0	33.0	26.8	28.4	30.0	36.6
29 Number new cars to total financed .....	53.1	48.6	57.6	54.9	54.0	46.2
30 Number used cars to total financed .....	46.9	51.4	42.4	45.1	46.0	53.8
31 Used car paper per cent with recourse*** .....	..	..	65.8	66.0	66.3	68.5
32 Cos. taking all used car paper with recourse*** .....	50.0	46.0	36.8	37.6	38.0	38.3
33 Cos. taking part used car paper with recourse .....	44.0	40.0	55.6	54.8	56.2	52.4
34 Cos. taking all or part used car paper with recourse .....	94.0	86.0	92.4	92.4	94.1	90.7
35 Used car paper above Red Book appraised value .....	..	..	..	27.3	29.3	38.9

### COMMERCIAL CARS

	1927	1928	1929	1930
1 12 or less equal monthly payments .....	\$46	\$121	\$68	\$109
2 13 to 18 equal monthly payments .....	57	**	137	305
3 Balloon note .....	**	**	**	..
<b>Increase of Losses Over Standard Terms</b>				
4 13 to 18 equal monthly payments .....	24	**	101	180
5 Balloon note .....	**	**	**	**
<b>Percentage of Repossessions</b>				
6 New cars with down payment of 33.3% .....	2.6	3.5	2.8	2.0
7 New cars with down payment of 25% .....	**	**	3.0	**
8 New cars with down payment of less than 25% .....	**	**	4.8	**
9 Used cars with down payment of 40% .....	4.2	3.1	5.4	3.1
10 Used cars with down payment of 35% or less .....	**	**	7.8	5.6
<b>Increase of Repossessions Over Standard Terms</b>				
11 New cars with down payment of 25% .....	**	**	7	**
12 New cars with down payment of less than 25% .....	**	**	71	**
13 Used cars with down payment of 35% or less .....	**	**	44	81
<b>Average Amount of Note Purchased</b>				
14 New cars .....	\$840	\$832	\$870	..
15 Used cars .....	368	395	381	..
<b>Percentage Sold on Instalments</b>				
16 New cars .....	54.9	51.6	45.6	52.7
17 Used cars .....	52.4	48.3	57.7	61.5
18 All cars .....	53.4	50.4	49.5	55.8
<b>Percentage of Trade-Ins, Sales, Etc.</b>				
19 Trade-ins on sales of new cars .....	52.5	51.2	45.3	53.3
20 Trade-ins on sales of used cars .....	22.2	22.3	31.1	35.1
21 Total trade-ins in per cent of new cars sold .....	67.7	64.1	72.6	81.9
22 Used cars sold in per cent of new cars sold .....	68.6	57.8	57.5	81.5
23 Used cars junked in per cent of total trade-ins .....	10.8	16.4	16.3	16.8
24 Skips per 1000 transactions .....	..	.8	3.5	1.6

\* This means amount owing minus amount received from sale.  
 \*\* No cases reported, or too few to justify inclusion.  
 \*\*\* Including repurchase agreement.  
 NOTE: This tabulation represents the composite experience of a large number of representative finance companies and is based upon individual averages for the first nine months of each year through 1929, and for the full year 1930. Items 16-23, inclusive, are derived from reports made by many automobile dealers, representative of the whole country, obtained through the courtesy of the National Automobile Dealers' Association.

## Buffalo Plants Report Progress

### Five Producers Cite Gains More Than Seasonal in Nature

BUFFALO, April 13—Automobile production in Buffalo plants increased sharply during March and is reaching higher levels in April, according to representatives of five assembling and manufacturing plants. Opinions accompanying the announcement were unanimous that the increase exceeds the normal seasonal expansion customary in March and April.

Combined production in plants of the Chevrolet Motor Co. and Fisher Body Corp. during the first 10 days of April has been 33 1/3 per cent above March. Both factories have production schedules which maintain the present rate throughout the month. During April the Chevrolet and Fisher factories will produce 12,000 automobiles as compared with 9000 in March.

Employment at the plants mentioned has reached 3000 men, working a six-day week. Comparative figures are not available, but the present total is at least 200 above that of last September.

Pierce-Arrow output gained 14 per cent in March over February and production now is slightly behind the same period in 1930. A further improvement in April is expected.

More than 3000 men are employed. While this number has not changed from 1930, the working hours and income per employee have been increased. William M. Baldwin, assistant general sales manager, said retail sales for the week ending April 4 were the highest for any week in the last seven months.

March production for Stewart Motor Corp., truck manufacturers, increased 30 per cent over February. Slightly more than 340 men are employed daily, with the March level being maintained through April.

Production equal to that of March, 1930, is being maintained by the Atterbury Motor Car Co.

The Ford Motor Co.'s local plant is continuing a near-capacity production schedule. More than 1200 employees, working the Ford five-day week, are producing 225 cars a day. Ford's production in Buffalo will be doubled within the next few months when the New Hamburg turnpike plant is opened.

### Bromfield Making Diesels

NEW YORK, April 13—Bromfield's Auxiliary Mfg. Co. has changed its name to the Bromfield Mfg. Co.

Capt. A. McLarnon has been appointed as general manager, succeeding John Liner.

The company has recently developed two, four and six-cylinder, 13 to 65-hp. Bromfield-Deutz Diesel engines suitable for marine propulsion, automotive purposes and stationary requirements. There is a Bromfield six-ton six-cylinder Diesel truck now operating in Boston.

### Edson Reports Increase

NEW YORK, April 13—Edson Mfg. Co., in a preliminary report of business conditions, indicates an increase during March with the early part of April showing a continuation of increase.

## CALENDAR OF COMING EVENTS

### SHOWS

Altoona, Pa., Automobile.....April 15-27  
International Garage Exposition, Berlin, Germany .....May 9-Aug. 9

### CONVENTIONS

Aeronautical Chamber of Commerce, Detroit .....April 11-19  
Middle Atlantic Jobbers Convention, Philadelphia, Pa. .....April 20-21  
American Welding Society Meeting, New York, N. Y. .....April 22-24  
Steel Founders Society, Pittsburgh, April 23-24  
Nat'l. Battery Mfg. Assn. Convention, Niagara Falls .....April 24-25  
Eastern Carolina Exposition, Greenville, N. C. .....April 27-May 1  
U. S. Chamber of Commerce, Atlantic City .....April 28-May 1  
American Foundrymen's Assn., Chicago .....May 4-7  
International Chamber of Commerce, Washington, D. C. .....May 4-9  
S.A.E. Spring Production Meeting, Milwaukee .....May 7-8  
American Gear Mfg. Assn., Buffalo, New York .....May 7-9  
Associated Business Papers, Hot Springs, Va. .....May 11-13  
American Society Mechanical Engineers, Baltimore .....May 12-14  
American Roadbuilders Assn., Washington .....May 15  
Automotive Engine Rebuilders Assn., Chicago .....May 18-21  
American Society Mechanical Engineers, State College, Pa. .....May 22  
Retail Delivery Assn. Convention, Washington, D. C. .....May 25-28  
National Foreign Trade Council, New York .....May 27-29  
Nat'l. Automobile Chamber of Commerce, New York City (Directors' Meeting) .....June 3  
Nat'l. Automobile Chamber of Commerce, New York City (Members' Meeting) .....June 4  
S.A.E. Summer Meeting, White Sulphur Springs .....June 14-19  
Steel Founders Society (Mid-Summer), French Lick, Ind. .....June 17-19  
National Association of Credit Men, Boston, Mass. .....June 22-27  
American Society Mechanical Engineers, Madison, Wis. (Oil and Gas Power Meeting) .....June 23-26  
National Association of Taxicab Owners, Chicago, Ill. .....June 29-30  
S.A.E. Aeronautic Meeting (in conjunction with Nat'l. Air Races), Cleveland, Ohio .....Sept. 1-3  
American Welding Society, Boston, Mass. .....Sept. 21-25  
National Safety Council, Chicago, Ill. .....Oct. 12-16  
Society Industrial Engineers, Pittsburgh, Pa. .....Oct. 14-18

### S. A. E. SECTION MEETINGS

April 8—Cambridge, Mass. (New England)  
April 20—Cleveland  
April 28—Washington, D. C.

## Feb. Exports Rose Sharply

### Reached Highest Point Since Previous September, Automotive Division Says

WASHINGTON, April 13—Reversing the downturn which has been evident in recent months, automotive exports from this country showed a greatly improved condition during February, being higher than at any time since last September, according to the Commerce Department's Automotive Division.

The month's foreign shipments totaled \$17,201,911, representing an increase of 11 per cent over the January total of \$15,480,487, although still remaining considerably below the February, 1930, total of \$32,784,139.

Shipments of passenger cars had a higher valuation in all classifications than was had during January. Trucks, while slightly improved in value, were lower in number of units exported, the greatest loss being in the class "over 1 1/2 tons and not over 2 1/2 tons." Comparison with February, 1930, by price classes and weight groups for passenger cars and trucks respectively is impractical due to changes in export classifications established Jan. 1, 1931.

As in January Denmark was the chief purchaser of American passenger cars and Sweden led in the demand for trucks. With the exceptions of the Union of South Africa, British India and Uruguay, shipments to each of the 15 leading passenger car markets were greater than in the preceding month. Belgium, Netherlands and Java and Madura accounted for the largest percentage increases.

The average unit export value for passenger cars and trucks was \$638 and \$591, respectively.

February shipments of other automotive products totaled \$8,996,915 as against \$8,353,431 in January, a gain of 7.7 per cent. The usual fluctuation occurred in exports of individual items, approximately one-half registering increases over the totals for the first month of the year, and the balance showing losses. Automobile engines, brake lining and gasoline and oil pumps were substantially higher, while second-hand passenger cars and spark plugs had a lessened demand.

### Barker Develops Boat

NEW YORK, April 13—The Barker Factory, Inc., Norwalk, Conn., has developed a Ford-powered family boat. The boat itself is built by Sea Sled Corp. and is powered by a Ford Model A engine converted by the Barker factory. The company plans distribution of these boats through Ford dealers.

### Rubber Stocks Increase

NEW YORK, April 13—Stocks of crude rubber in dealers' hands in the Far East on March 31 amounted to 44,317 long tons, according to The Rubber Exchange of New York. This compares with 39,500 tons at the end of March last year and with 42,986 tons which were held at the end of February.